MODEL AIRPLANE NEWS

PERFECTING THE IMMELMANN

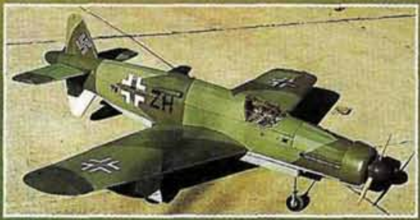
THE WORLD'S PREMIER R/C MODELING MAGAZINE

48120

October 1995

200+MPH! FLYING

—PAGE 146



BUILD A WW II DORNIER 335 ELECTRIC TWIN

.S. 32
X-H
ELIABLE
OWER

ORKBENCH ECRETS—

FUNCTIONAL
PEED/DIVE BRAKES
CALE LOUVERS
PANEL DETAILS

BUILDER/PILOT REPORT
BYRON GEE BEE R-2

DESIGNCAD
2D 6.0 REVIEW

FIELD & BENCH REVIEWS—

HOBBY LOBBY TIMOTHY
HOBBY SHACK FLYING START
AIRTRONICS THERMAL EAGLE

A $3.95 CANADA $4.95

10>

71896 48120 4

OCTOBER 1995 VOLUME 123, NUMBER 10

MODEL AIRPLANE NEWS

FEATURES

ABOVE: *Hobby Shack's Flying Start is a unique, fun-to-fly trainer with good flight performance. It also has a pull-start glow engine that eliminates the need for many other pieces of flying-field equipment. All you need are fuel, a glow plug and a driver, and you're ready to fly. Assistant editor Debra Sharp built and flew this model as her first R/C project. Photo by Tom Atwood.*

ON THE COVER: *Byron's great performer, the Gigantic Gee Bee R-2, settles in for a slick three-point landing. Frank Ponteri gives you the builder's-eye view of what has to be the icon for "golden age racing." See page 20 for our "Field & Bench Review." Photo by Rob Wood.*

FEATURES

CONSTRUCTION

COLUMNS

COLUMNS

DEPARTMENTS

EDITORIAL

GERRY YARRISH

SCALE FIRST STEPS

After years of building and flying scale models for the simple enjoyment of it, I finally entered my first scale competition—the Father's Day Fun Fly and Scale Meet hosted by the Kingston Radio Control Modelers in Kingston, Ontario, Canada. I was full of questions about what I had to do. Here are some "Cliff Notes" to help *you* with *your* first scale contest.

PREPARATION

• **Homework.** The first thing to do—before you build your model—is to organize the documents! Then you can make every effort to build your model—scratch-built or kit—to match your documentation. Don't wait until you're ready to paint your model to find a good-looking color scheme.

• **Static.** Because confused judges give low scores, make your documentation neat and orderly. You need proof of color and markings and of outline. A 3-view drawing is not absolutely necessary (photos can be used), but drawings serve well if you can't supply photos of the aircraft's front, top and side views. Every documentation package should include sections for specifications, photographs, proof of color and markings and proof of outline. If you have good color photos, you can use them for both outline and color documentation, and color chips won't be necessary.

Here, I'm getting ready for another practice flight a week before the scale contest. Sal Manganaro (center) and Model Airplane News associate editor Roger Post are on hand to help. Practice and good documentation are the keys to doing well at your first scale meet.

• **Specifications.** You'll need one page describing both the full-size aircraft and your model. Include wingspans, lengths, engines used, etc. Describe the full-size aircraft's flight performance, and specify whether the model was scratch- or kit-built.

• **Photographs.** This is where you show the judges that your model looks like the full-size aircraft. You should include at least one photo of your subject and label it "Subject Aircraft." Other photos of similar types of aircraft should be labeled "Type Aircraft." Don't include any photos that point out errors in your model; they'll hurt your score.

• **Color and markings.** This section proves that your model has been painted correctly and its markings are accurate. You can use a combination of photos, a written description, color chips and color 3-views.

• **Outline.** This section proves that you built your model accurately. The most acceptable proof of outline is a 3-view drawing. If your 3-view doesn't match the full-size aircraft, identify and label the discrepancies, and refer the judge to your photo section. Photos take precedence.

FLYING SCALE

There are mandatory and optional maneuvers. Takeoff, a procedure turn, the landing pattern and landing are usually mandatory. Optional flight maneuvers should be kept simple. In Kingston, I did a loop, an aileron roll and a split-S. Placement and "prototypical execution" are important considerations here.

• **Placement.** Consider the judges as the center line for all your maneuvers. Start a roll at about 50 feet before the judges, and end it at the same distance past them. Most low flight scores result from maneuvers that were started at the judges' center line instead of before it. Loops need to be started and finished with straight-and-level flight. Altitude control is also important. Fly at the same altitude for procedure turns, and enter and exit loops at the same heading and altitude. When it's time to land, make all four pattern turns at 90 degrees, and try to have the wheels touch down right in front of the judges. You will, however, lose points if you scare them!

• **Prototypical execution.** Flying in a scale manner is important. If the full-size aircraft has to dive slightly to gain air speed for a loop or a roll, you need to fly the model that way. Because you "call" all flight maneuvers, the judges are supposed to score the flight only between when you say "Beginning now" and when you call "Complete." But they're only human, they can't help but be affected by how you fly and set up your model between called maneuvers. Fly your model in a scale manner at all times; banking angles should be shallow and precise, and use your throttle. Don't fly the entire flight at full throttle.

Following the above guidelines, I was lucky enough to place third. Give scale competition a try, practice flying, pick a small contest and have fun. Good luck!

SMALL STEPS FLY-IN

The 8th Annual Small Steps Fly-In, sponsored by *Model Airplane News,* Small Model Airplane Lovers League (SMALL) and the Dallas R/C Club will be held on October 7 and 8, 1995, at the Dallas R/C Club field in Seagoville, TX. Entries are limited to airplanes powered by .26ci engines and smaller, and the event is open to R/C, U-control, free-flight, glow, gas, electric, CO_2 and rubber-powered models. There are no limits on aircraft size and the number of engines used. AMA membership is required. Food and drink will be available at the field, and a Saturday-night Dutch-treat banquet is planned. An award for the Best All-Around-Good-Guy and other special prizes and drawings are planned. A $10 fee covers all the models you want to bring; CD will be Eddie Williams.

There were almost 200 models displayed and flown last year. For more information, write to Small Steps, 4873 Fallon Place, Dallas, TX 75227. ■

MODEL AIRPLANE NEWS

AirAge PUBLISHING

SUBSCRIPTION PRICES: U.S. & Possessions (including APO & FPO): 1 year (12 issues), $27.95; 2 years (24 issues), $49.95. Canada: 1 year, $43.82; 2 years, $81.27 (Canadian prices include G.S.T.). Elsewhere: 1 year, $40.95; 2 years, $75.95. Payment must be in U.S. funds. Single-copy prices: $3.95 (USA); $4.95 (Canada). Canadian G.S.T. registration no. R130754872. Canada Post International Publications Mail Product (Canadian Distribution) Sales Agreement No. 0609145.

TO SUBSCRIBE: call 1-800-827-0323

MODEL AIRPLANE NEWS (ISSN 0026-7295, USPS 533-470) is published monthly by Air Age, Inc., 251 Danbury Rd., Wilton, CT 06897. Connecticut. Editorial and Business Offices, 251 Danbury Rd., Wilton, CT 06897. Phone: 203-834-2900; fax: 203-762-9803. Michael F. Doyle, Chief Executive Officer; Y.P. Johnson, President; G.E. DeFrancesco, Vice President; L.V. DeFrancesco, Secretary; Yvonne M. DeFrancesco, Treasurer. Second Class Postage Permit paid at Wilton, Connecticut, and additional Mailing Offices.

CONTRIBUTIONS: To authors, photographers, and people featured in this magazine, all materials published in *Model Airplane News* become the exclusive property of Air Age, Inc., unless prior arrangement is made in writing with the Publisher. The Publisher assumes no responsibility for unsolicited material. Only manuscripts and supporting material accompanied by an SASE will be returned.

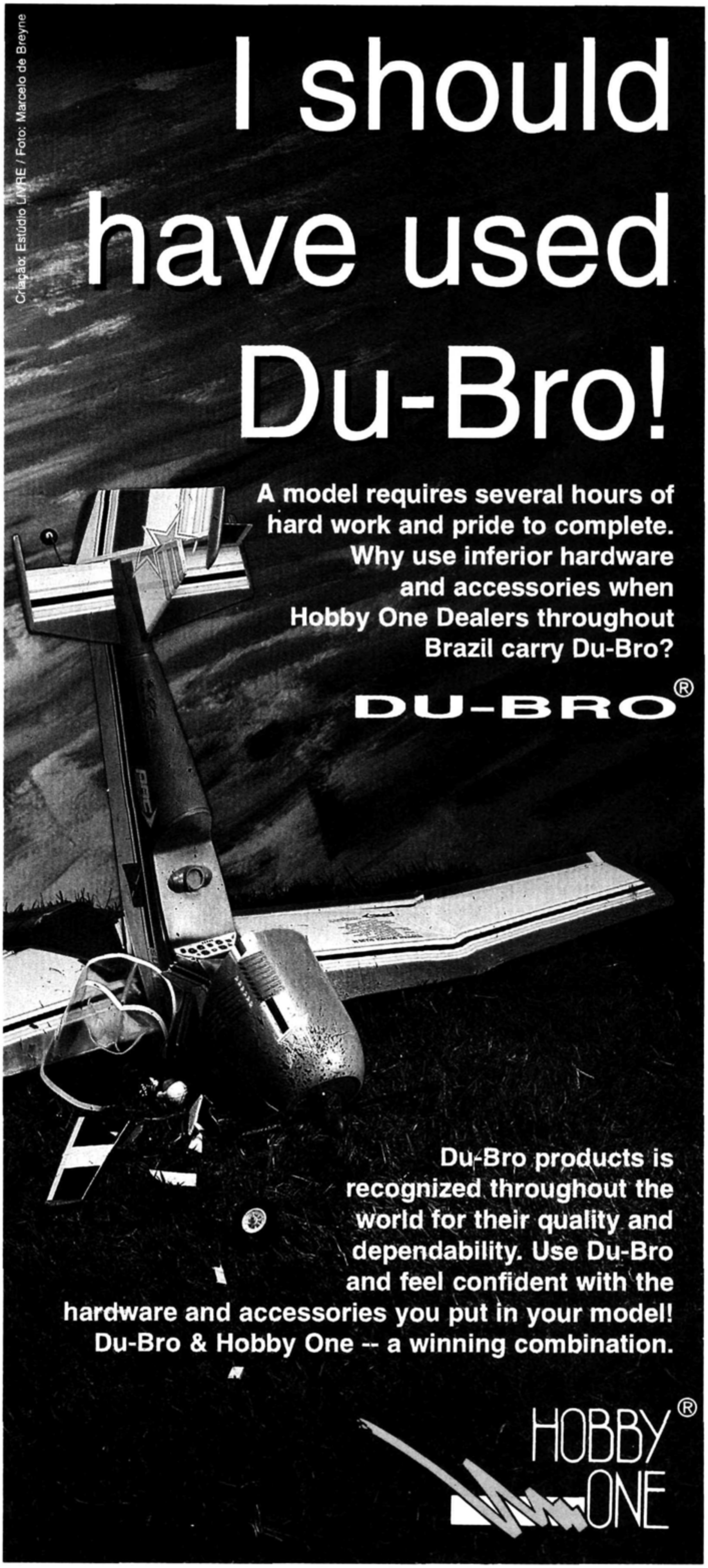
ADVERTISING: Advertising rates available on request. Please send advertising materials, insertion orders, etc., to *Model Airplane News*, Advertising Dept., Air Age, Inc., 251 Danbury Rd., Wilton, CT 06897. Phone: (203) 834-2900. FAX: (203) 762-9803.

CHANGE OF ADDRESS: To make sure you don't miss any issues, send your new address to *Model Airplane News*, Subscription Dept., P.O. Box 428, Mount Morris, IL 61054, six weeks before you move. Please include the address label from a recent issue, or print the information exactly as shown on the label. The Post Office will not forward copies unless you provide extra postage. Duplicate issues cannot be sent.

POSTMASTER: Please send Form 3579 to *Model Airplane News*, P.O. Box 428, Mount Morris, IL 61054

Member Audit Bureau of Circulations

PRINTED IN THE USA



AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News**, 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

F1 AFTERTHOUGHTS

I just picked up the August '95 issue of your magazine and read Nick Ziroli's article about Formula One racing. I wanted to add a couple of thoughts.

I have been to every Madera race, and I was also at Galveston last year. Top speed at Galveston was 157mph, and top speed at Madera was 142mph, but both speeds were aided by tailwinds of from 15 to 20mph. Planes should be checked from both directions, and an average should be calculated, or the speeds should not even be published.

The aircraft at Madera seemed to fly at the same speeds as the AT-6s. I think the Formula One class should be between the AT-6 and the Unlimited classes, therefore I agree with Ziroli and Hi-G regarding engine size and wing-chord thickness.

There is one other point that I'd like to make regarding an "entry-level" race class. There is an AT-6 kit that, as far as I'm concerned, is head and shoulders above the others. Fred Burgdorf should be very proud of what he developed, and folks who haven't checked one out closely should do so, because it is an excellent piece of work (the downside is the $2,000 price tag). This complicates the idea that this class is "entry level."

Entry level means low cost. If there are no limitations on motor modifications and airframes, the Formula One class will follow the Unlimited class in regard to cost. An example is my Unlimited entry for the first Madera race. It was a P-51 with a 4.2 engine that cost less than $1,500, and it was the 11th-place qualifier. The top Unlimited aircraft today may cost $10,000 or more. I would hate to see the Formula One class follow this history, because it would preclude many "entry-class" folks.

SCOTT BROUGHTON
Lufkin, TX

Scott, thank you for your comments. We agree that every effort should be made to keep entry-level events and classes alive to guarantee the growth of the sport. Those who make the rules for 42-percent Formula One should try to keep this class simple and inexpensive, and they need to work together to standardize engine size. Racers will inevitably push the rules as far as they can to win, but by maintaining limits within this event, the 42-percent Formula One should not develop into a big-bucks class. GY

JETS OVER DELAND CORRECTION

In the July '95 issue, the respected Mr. Dan Parsons states on page 31, that "he [Wolfgang Klühr] has been the German national scale champion three times. Wolfgang's MiG-29 is from his own kit, which unfortunately, is not available in the U.S."

It is correct that Wolfgang Klühr has been the German national scale champion in ducted fans three times, but the DMFV has a separate class of competition for ducted-fan aircraft. His famous kit of the MiG-29 has been available for several years in the United States. Our company—Inhoff Models—has the exclusive rights and license to manufacture, import, distribute and market this magnificent kit in North America. The model has been updated to meet American demands and is currently in production. Numerous models have been sold and campaigned at various ducted-fan meets, particularly in the Southwest.

For further information on the MiG-29 kit, contact Inhoff Models at 113 Verna Ct., Kelowna, B.C., Canada, V1V 1S9; (604) 763-6453; fax (604)

763-2468. We thank you and your magazine for giving us the opportunity to inform your readers of this, and we encourage both Dan and your magazine to keep up the good work.

MATTHIAS INHOFF
Kelowna, B.C., Canada

Matthias, thank you for informing our readers that the MiG-29 is, in fact, available in the U.S. We will continue our jet coverage in future issues, and we're sure that we'll see more of those great-flying MiGs. DS

"CHIPPY" OFF THE OL' BLOCK

I saw your article "Installing Robart Custom Oleo Landing Gear Struts," on page 44 of the July issue of *Model Airplane News*. Where did you get the deHavilland Chipmunk? It's my favorite WW II trainer, and I was pleased to see that you didn't paint it Canadian yellow! Is it a kit? Where did you get the canopy and the cowl?

JOHN APPOLLOS
Brooklyn, NY

John, the DHC-1 Chipmunk (kit no. 102) that appeared in my landing-gear article is available from Ohio R/C Models, 4251 Lutheran Church Rd., Germantown, OH 45327; (513) 859-1660; fax (513) 859-7202. It costs about $279 and comes with a greenhouse canopy and a lightweight fiberglass Gypsy Major engine cowl. It has a wingspan of 82 inches, and I power it with my trusty old Zenoah G-23 gasoline engine. I chose the 1950 trainer paint scheme because it was so colorful and unique compared with the standard yellow or all-silver versions often seen at the flying fields. I really like the way "Chippy" flies; it's smooth and stable. Look for a full "Field & Bench" review in an upcoming issue. GY ■

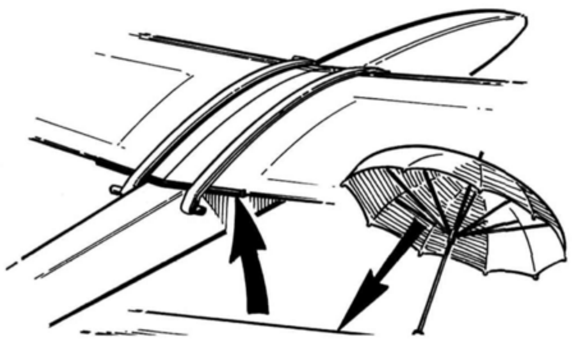
ERRATA

In Mike Billinton's engine review of the 3W 120B2 twin 2-stroke in the August '95 issue, the 3W's correct capacity is 6.969ci (114.20cc).

HINTS & KINKS

JIM NEWMAN

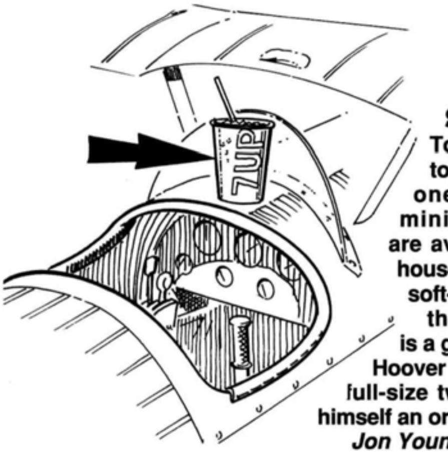
Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



TRAILING-EDGE SAVER

Protect that trailing edge from rubber bands by using the metal U-shape ribs from an old umbrella; they can be neatly glued over the sharp trailing edge.

Eric Marsden, Horndean, Hants., England

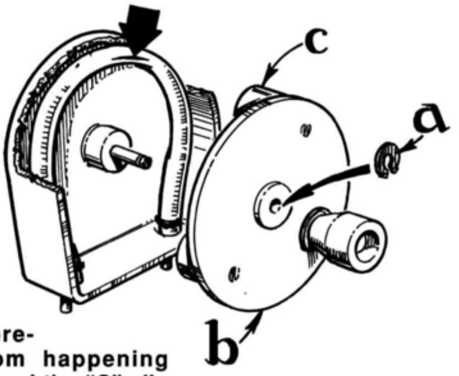


SOFT-DRINK SENSATION

To add a "gimmick" to your cockpit, buy one of the many miniature items that are available from doll-house stores. This mini soft-drink cup glued to the top of the dash is a great example (Bob Hoover could barrel roll a full-size twin while pouring himself an orange juice!).

Jon Young, Beaverton, OR

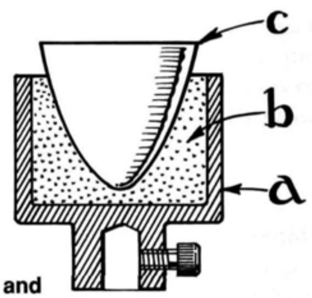
FUEL-PUMP FIX



Tom's hand-crank fuel pump developed a split in its expensive tubing after a few months. To prevent that from happening again, he removed the "C" clip (a) so that when he finishes flying, he can remove the disk (b) that holds the rollers (c). This relieves the tube of the roller pressure while it's not in use. To keep the disk in place when fueling, he applies gentle, inward pressure.

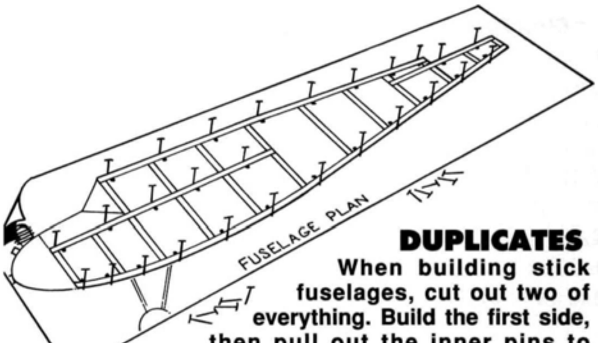
Tom Zurcher, Roswell, GA

HIGH-GRIP SPINNER CUP



The usual spinner cup contacts only a narrow ring that can slip and "burn" the spinner. To provide more gripping area, fill the starter cup (a) with silicone rubber (b), then press the lightly greased spinner (c) into it, and leave it to set. Make sure the spinner is centered properly. After removing the spinner, wash the grease out with alcohol. You can make these custom adapters to fit your other spinners of different shapes.

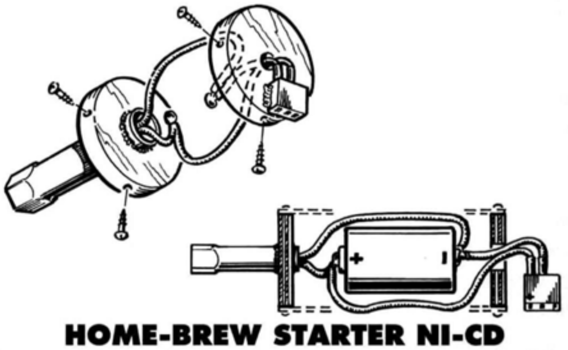
Heinrich Lipp, Pulheim, Germany



DUPLICATES

When building stick fuselages, cut out two of everything. Build the first side, then pull out the inner pins to remove it. Place the second set of sticks against the remaining pins, and push the pins that were removed back into the vacant holes shown here. The second side will be a duplicate of the first.

Ralph Evans, Tucson, AZ



HOME-BREW STARTER NI-CD

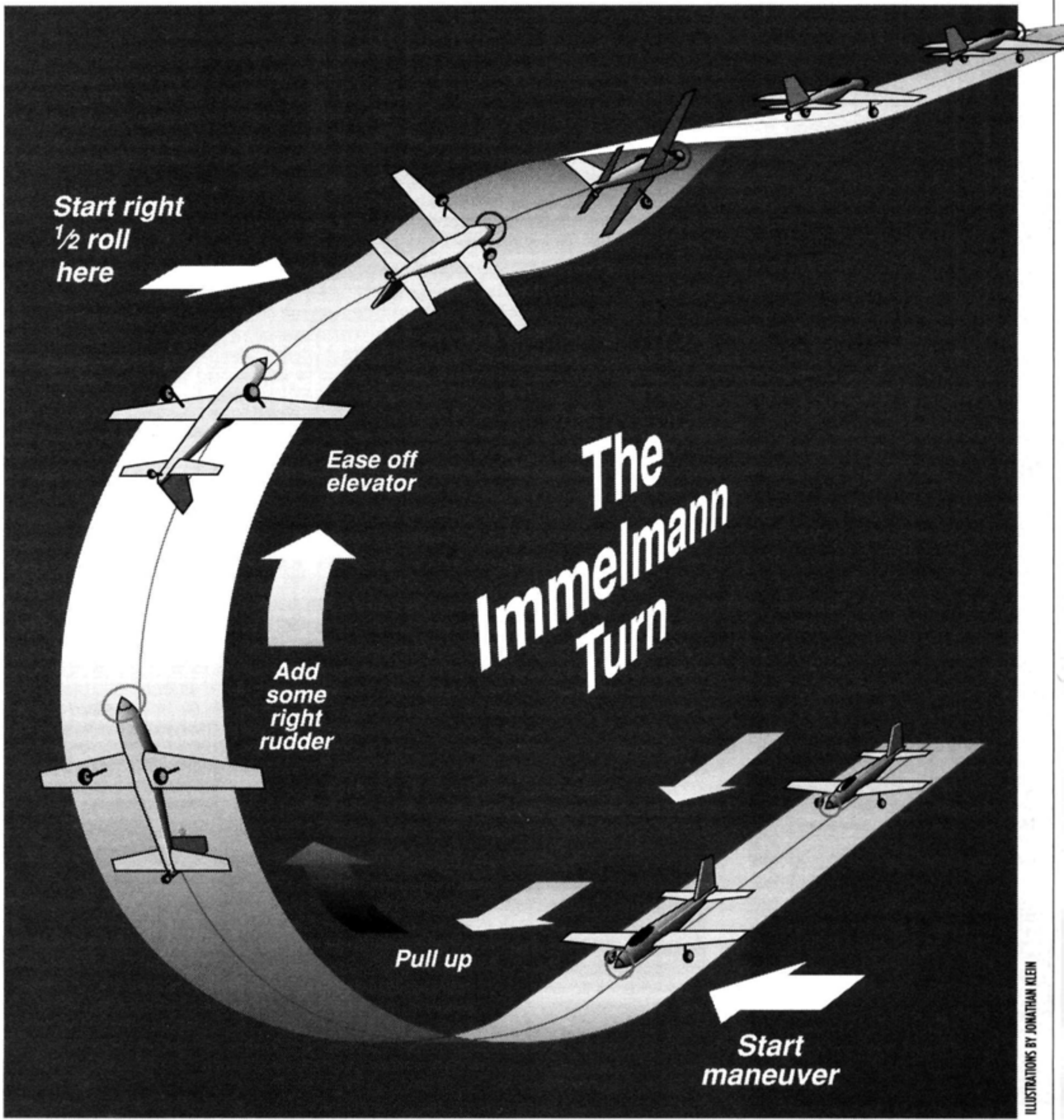
Epoxy a McDaniel's Head-Lock (or something similar) into one of two ¼-inch-thick (6mm) plywood disks, then wire in a 4000mAh Radio Shack Ni-Cd and a three-pin Deans plug for charging. (To guard against reverse polarity, make a note of the plug connections.) Glue the plug to the end disk, then slip the assembly into a heavy cardboard or plastic tube, and secure it with wood screws. The disks and the tube can be covered with MonoKote or painted.

Ron Caliendo, Chicago, IL

AEROBATICS MADE EASY

DAVE PATRICK

THE IMMELMANN TURN



ILLUSTRATIONS BY JONATHAN KLEIN

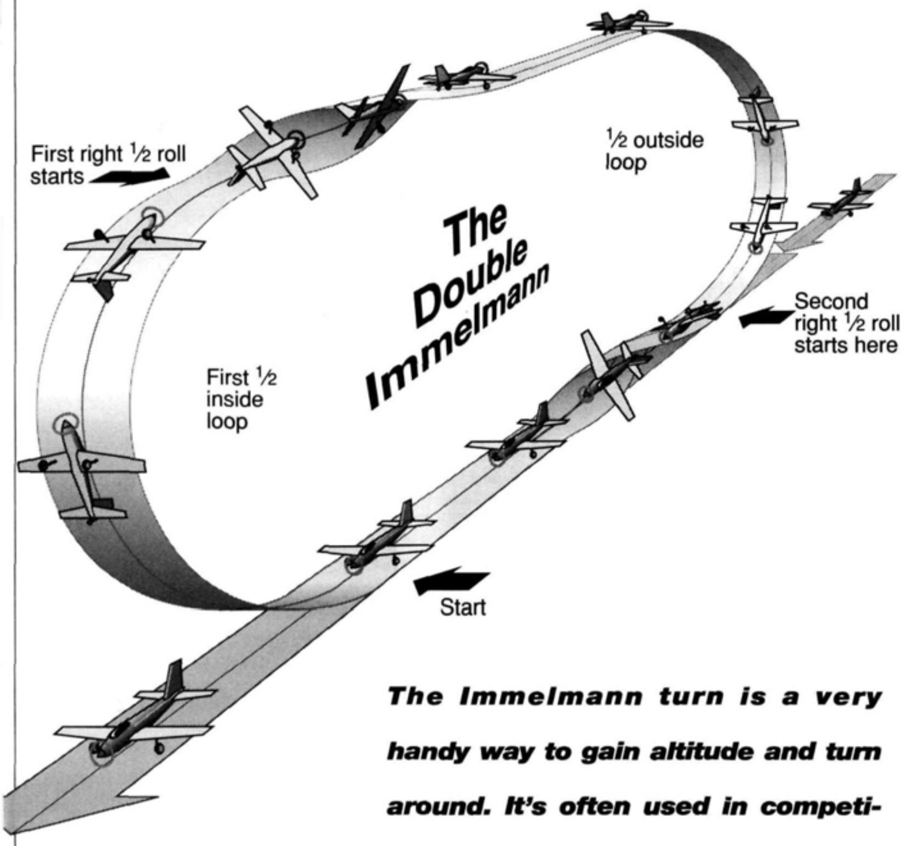
THIS ONE has been around a really long time. I did some research and discovered that Max Immelmann—a German WW I fighter pilot—invented the turn way back in 1915. Turns out he was famous and very successful—for a while—but, like a lot of other fighter pilots of that era, his luck ran out, and he was shot down. His turn is nothing like the Immelmanns we do today; his was a clever combination of a loop and a stall turn to elude the enemy and to then position his aircraft to shoot them.

So much for history. Let's look at what today's Immelmann looks like. Quite simply, it's a ½ inside loop with a ½ roll at the top. That's it. But, like so many other "simple" maneuvers, many very good pilots fail to perform it correctly and, to be honest, it isn't that easy to do properly. Let's look into the problems and how to fix them.

BACK TO BASICS

Remember that most maneuvers—even the most complex ones—can be broken down into basic components of even simpler maneuvers. These can be the building blocks as you progress to complex maneuvers. The Immelmann is a classic example of this "building block" approach. If you can do a loop and a roll, just perform half of each, and you've got it...right? (You do have to be pretty good at these first!) Most of the problem with the Immelmann lies in the transition from looping to rolling. At competitions, the judges require the ½ roll to be *immediately* at the top, further adding to the difficulty of the transition.

• **Roll right.** That's it. Now, here's the deal: because of the "P" factor, most aircraft yaw to the left when you pull vertical; the correction is right rudder. There are always exceptions but, most of the time, this works really well. As your plane is pulling through its ½ loop and you apply the traditional rudder, keep that right rudder in as you roll right at the top of

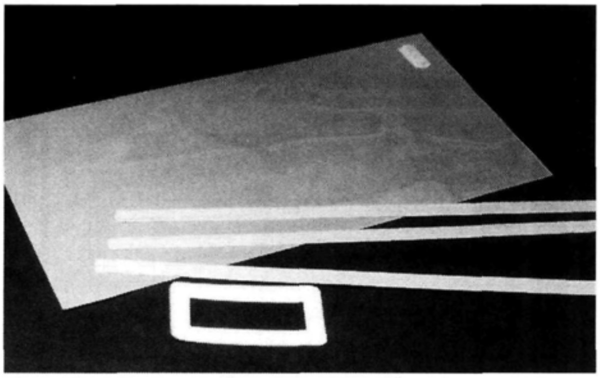


The Immelmann turn is a very handy way to gain altitude and turn around. It's often used in competition, so learning to do it right is important.

the loop. This is needed to prevent the nose from dropping as you roll, and the roll will end up looking great. Now you simply have to learn how to remove the rudder input smoothly as the roll nears completion. This greatly simplifies the transition and the learning process. By the way, as you roll, don't forget to release the up-elevator that you had in during the loop. You may find that you'll need a bit of "up" after the roll, owing to lower air speed. You'll have to experiment to find out what your particular aircraft does. This trick—right roll, right rudder—even works with the Double Immelmann!

The Immelmann turn is a very handy way to gain altitude and turn around. It's often used in competition, so learning to do it right is important. Don't forget: a nice, round ½ loop, a little right rudder and, immediately at the top, a ½ right roll while still holding a bit of right rudder—without losing altitude or heading—and you'll get a "10" every time. Practice the simple stuff, and you'll learn the harder maneuvers much more quickly. ■

HOW TO



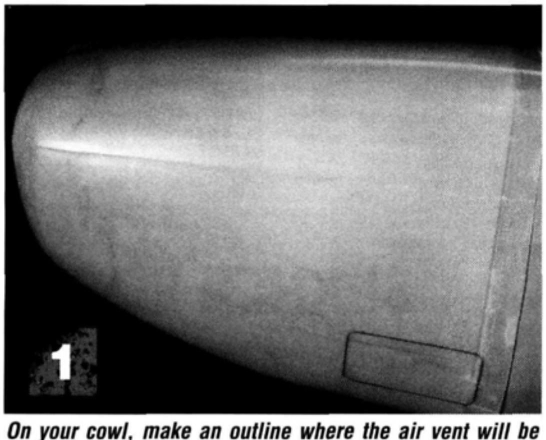
Materials: • 1 sheet of 1/32-inch lite-ply • 1/4-inch balsa triangle stock • CA

Make Functional Air Louvers

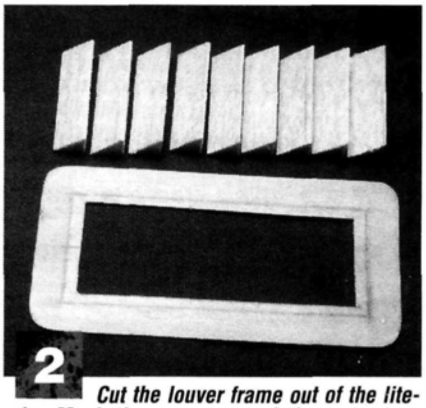
by JIM SANDQUIST

Add scale, engine-cooling vents to your model

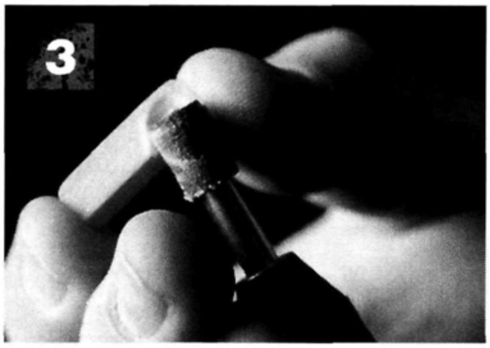
An engine that fits tightly in a cowl often overheats because there aren't enough air-exhaust openings at the rear of the cowl. Functional air louvers are one way to add air exhaust as well as some detail to your plane.



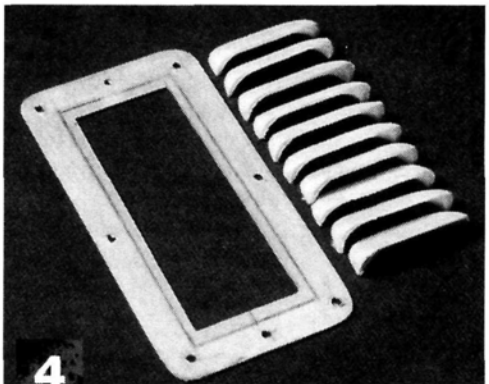
1 ***On your cowl, make an outline where the air vent will be placed, and cut it out.***



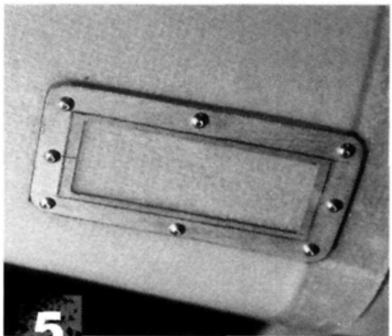
2 ***Cut the louver frame out of the lite-ply. Mark the area around the cutout as shown, and cut the triangle stock to length.***



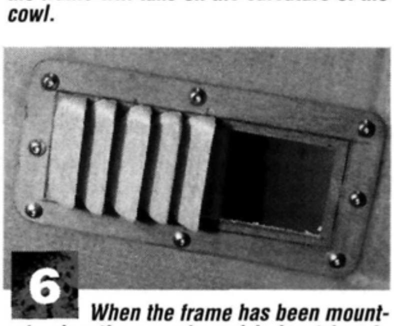
3 ***Use a Dremel tool or a round dowel with sandpaper on it to shape the louver; this takes only a few minutes with a Dremel.***



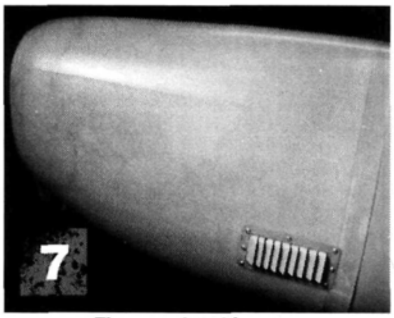
4 ***The louvers are shaped and ready for installation on the frame, and the frame has been drilled for the mounting screws.***



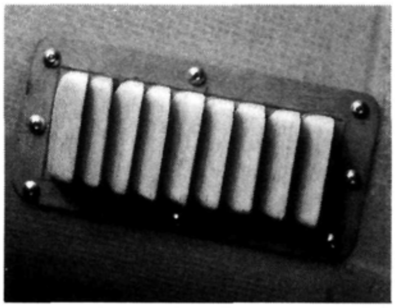
5 ***Use screws or glue to mount your frame on the cowl. This ensures that the frame will take on the curvature of the cowl.***



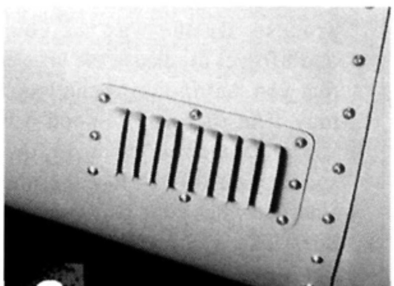
6 ***When the frame has been mounted, glue the pre-shaped balsa triangle stock into place.***



7 ***The completed louvers.***



8 ***The louvers ready for priming.***



9 ***The cowl and louvers have been primed, and the panel lines and scale fittings are in place. All that's left is to paint the model!***

AIR SCOOP

CHRIS CHIANELLI

New products or people behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

THUNDER TIGER .91 4-Stroke

Does the high price of 4-stroke engines get you down? It gets me down. You know, the 4-stroke glow engine was popular and doing very well in terms of sales until the recent problems with the yen/dollar exchange rates. Well, Thunder Tiger has decided to enter the 4-stroke market, and we consumers will benefit. This new .91 4-stroke pictured here formally announces Thunder Tiger's entry into the 4-stroke glow market. The street price?—about $200. How does that sound? The low price isn't all. Thunder Tiger's other ace is Mirahara-san. For more than three years now, former O.S. president and designer Mr. Kaz Mirahara has been contributing his model-engine manufacturing expertise to Thunder Tiger. With this level of design creativity on their team, Thunder Tiger is likely to put its 4-stroke line on a performance par with those of other leading manufacturers. The .91 will be available by early fall, and a .51, 1.20 and 1.80 twin will soon be added to Thunder Tiger's 4-stroke line. Stay tuned.

Looking for something different? Open up the Hobby Lobby catalogue and you'll find it. Here's what I found: Simprop's 78-inch-wingspan, electric Douglas DC-3. This DC (direct current) Dakota uses two Graupner Speed 600s with gearboxes. (You know what Professor Keith Shaw says about electric twins: more efficient circuitry.) The fuselage and cowls are fiberglass, and the wing and horizontal stab are foam-cores that have been sheeted with obechi. The wing center section has been slightly enlarged to accommodate larger-diameter, more efficient props. Scale-looking takeoffs from grass are possible with only 12 cells but are even better with 14 to 16. The wing loading is 28 ounces per square foot—pretty good for a plane of this size. For more information, contact Hobby Lobby International, 5614 Franklin Pike Circle, Brentwood, TN 37027; (615) 373-1444; fax (615) 377-6948.

DC DC-3

Contest-Grade Finish

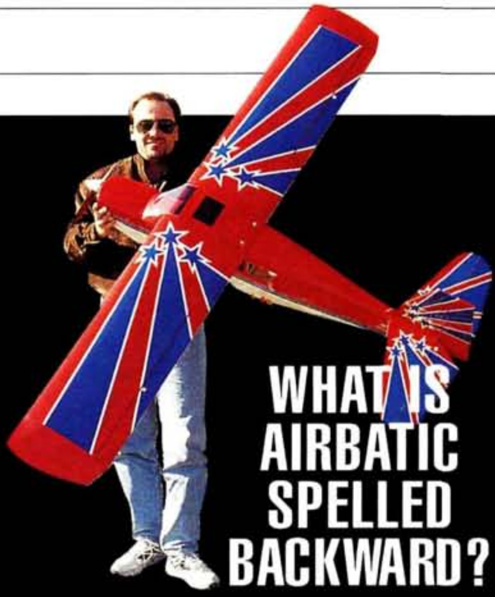
Few will disagree that aluminum is one of the most difficult finishes to simulate on a model. Innovative Model Products has solved the problem with Skini-Dip—an easy way to give your model that sought-after metallic look and feel. One look at John Chevalier's contest-winning Ryan STA will convince you of its merit. This simple, two-step product simulates aluminum, stainless steel and even chrome. For more information, contact Innovative Model Products, P.O. Box 4365, Margate, FL 33093.

Magnum XL-25 and XL-28

The Magnum line has expanded once again with the finely finished, ball-bearing, chrome, ABC XL-.25 and XL-.28 engines. The smooth, glass-bead crankcases and polished heads of the Magnum XL engine belie the fact that these ball-bearing engines cost the same as plain, bronze-bushed ones. Both engines feature easy-to-adjust, two-needle carburetors for quick starting and excellent throttle transition. Ask your hobby dealer about delivery and price. For more information, contact Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728-8610; (714) 963-0133; fax (714) 962-6452.

Altech Diesels

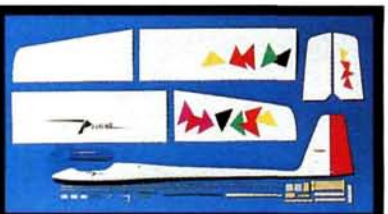
Starting with this .40 R/C ABC, Altech Marketing will import the Irvine line of diesels. Irvine diesels are state-of-the art, they really perform, and they have a throttle response that's on a par with glow engines. A .20 R/C ABC and a Mills 0.75cc (.046ci) will follow shortly. This is a replica of one of the most famous small diesels ever produced—with more performance and longer life than the original. The Irvine Mills is an ideal free-flight engine that's well-suited to vintage designs. Stay tuned for more Altech/Irvine updates.



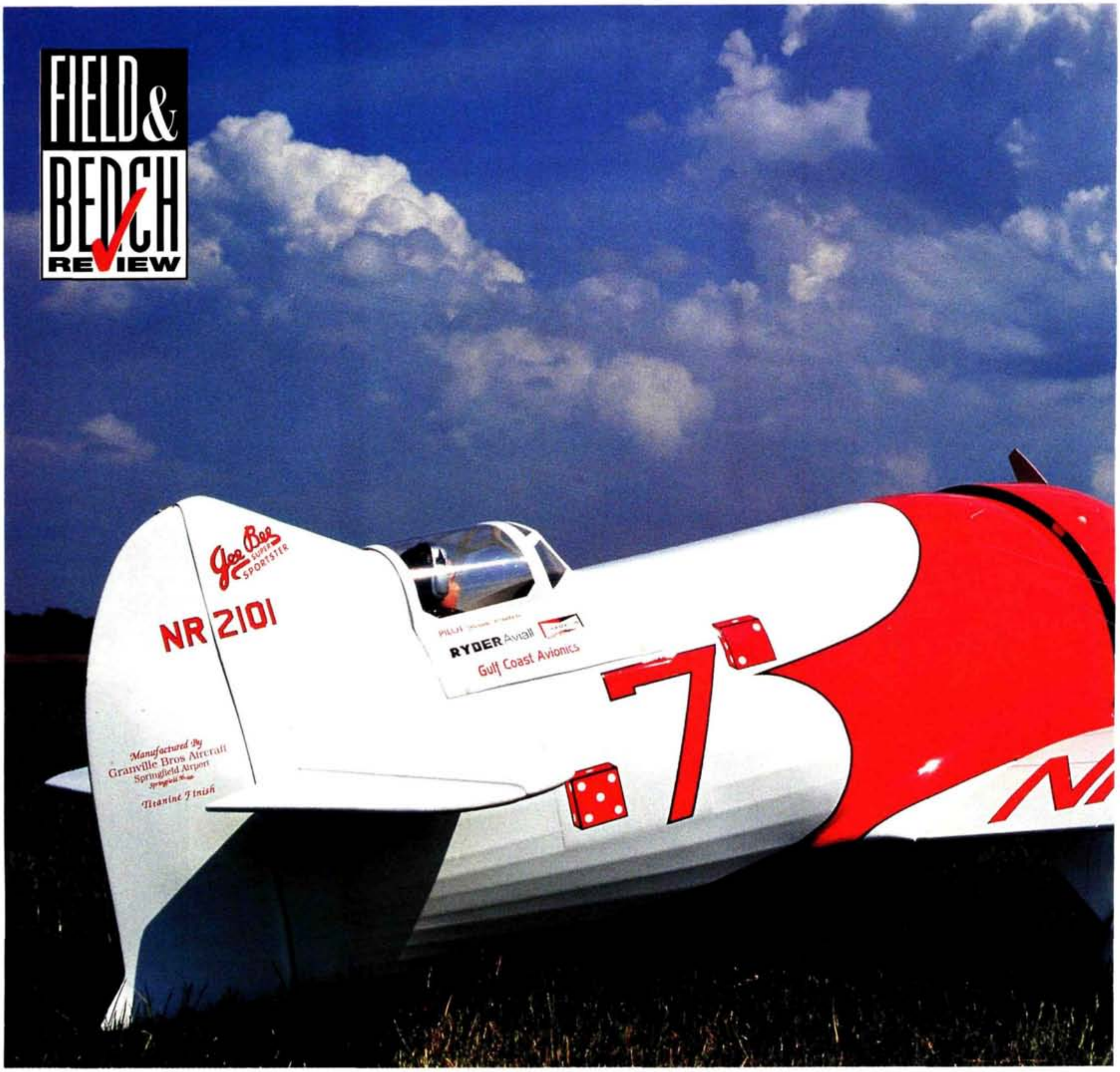
WHAT IS AIRBATIC SPELLED BACKWARD?

The Citabria. There's no doubt this design has claimed its place as a classic in the history of general aviation with its ability to teach the basics to novices and aerobatics to advanced pilots. Midwest's new 81-inch-wingspan, 1/5-scale Citabria is just like the full-scale plane. Fly it slowly, and it's a mild-mannered floater much like a Cub. Pour on the coal, and it's a hot air-show machine. The kit is typical Midwest and includes easy, yet rugged, lightweight, jig-locking, Micro-Cut balsa construction. A molded cowl, wheel pants, a windshield and snap-in side windows add to the scale detail. The kit also includes drilled aluminum landing gear and decorative wing struts, full-size plans and an illustrated Success Series construction manual that takes you through the entire building process. Specs: wing area—970 square inches; flying weight—7.5 to 8.5 pounds; engine requirements: .60 to .75 2-stroke or .65 to .91 4-stroke. List price—$259.95. For more information, contact Midwest Products Co. Inc., 400 S. Indiana St., P.O. Box 564, Hobart, IN 46342; (219) 942-1134; fax (219) 942-5703.

Robbe Prisma ARF



This attractive ARF thermal-seeker can ride even the lightest thermals without coming down. Prisma can be directed into the slightest rising warm air, where it can circle for extended periods. This model fulfills the requirements for the F3J class, yet its low-speed flight capabilities and minimal tendency to drop make it easy to bring in for spot landings and make it suitable for the novice. An optional, low-drain, geared motor provides sufficient power for several climbs, and makes extended flying times possible. Prisma features a white epoxy fuselage with molded-in stab and four-piece, built-up wings machined and covered in multicolored film. Contact Pica Enterprises Inc., 2657 N.E. 188th St., Miami, FL 33180; (305) 935-1436; fax (305) 937-2322.



"DURING OSHKOSH 1992, thousands of aviation enthusiasts were transported back in time to those magnificent years known as the 'golden age of air racing.' The time machine for this adventure was a replica of the famous Gee Bee R-2 racer built by two industrious aviators, pilot Delmar Benjamin and his friend Steve Wolfe. Their 'dream' thrilled everyone with its aerobatic performance. This aircraft, which history has labeled as 'unsafe' and 'a death trap,' was being flown as though it were on rails in various attitudes only several feet above the runway."

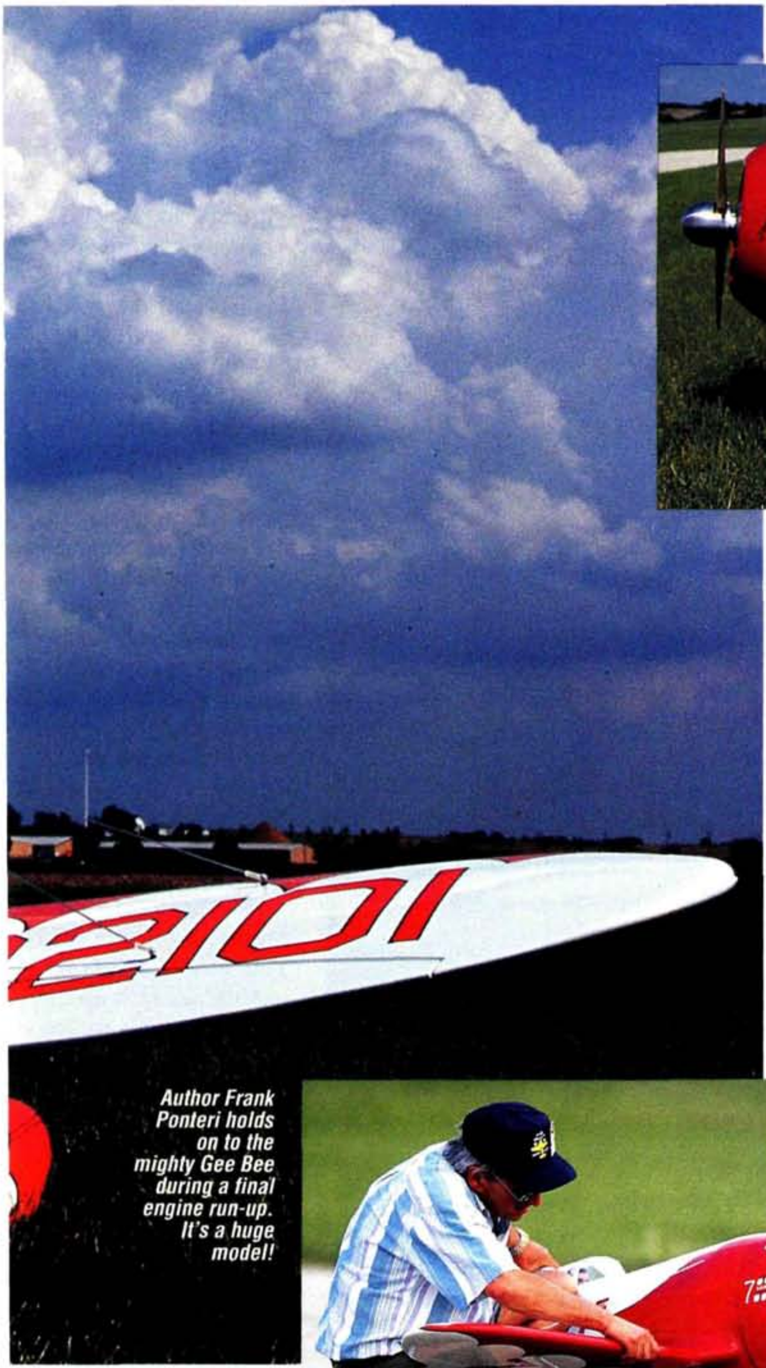
by FRANK PONTERI

This quote was taken from the introduction printed in the Byron Gee Bee construction manual, which, in a few words, describes some of the history of this aircraft.

Over the years, on very rare occasions, some brave modeler would take a model of the Gee Bee that had been built from plans or drawings to a giant-scale fly-in. If someone attempted to fly the aircraft, the flight line would virtually come to a standstill because most of the participants wanted to see whether this modeler could get this aircraft up and

Byron Originals

Gee Bee S



COLOR PHOTOS BY RICH GRAHAM; B&W PHOTOS BY FRANK PONTERI

¼-SCALE CLEVELAND AIR RACER

Author Frank Ponteri holds on to the mighty Gee Bee during a final engine run-up. It's a huge model!

down in one piece.

When I learned that Byron Originals* planned to offer the Gee Bee, my curiosity was aroused. This would be one I'd *have* to build.

The Deluxe Gee Bee kit consists of these fiberglass parts: fuselage (one-piece), rudder, wheel pants and strut covers. A first for Byron is the built-up sheeted wing with laser-cut parts. The fuselage formers were also laser cut; there are no "die-crunch" parts in this kit. The foam-core stab and elevators are sheeted, and all the hardware, plus the wheels, a spinner and decals are included. Full-size templates are provided to help you duplicate the original paint scheme. Optional items include a mock 9-cylinder radial engine, snap-on flying wires, an engine and a Byron PurrrPow'r mount.

CONSTRUCTION

• **The wing.** As with most Byron kits, construction begins with the wing, which must be completed before the fuselage formers are installed. This ensures that the wing will mate perfectly with the fuselage.

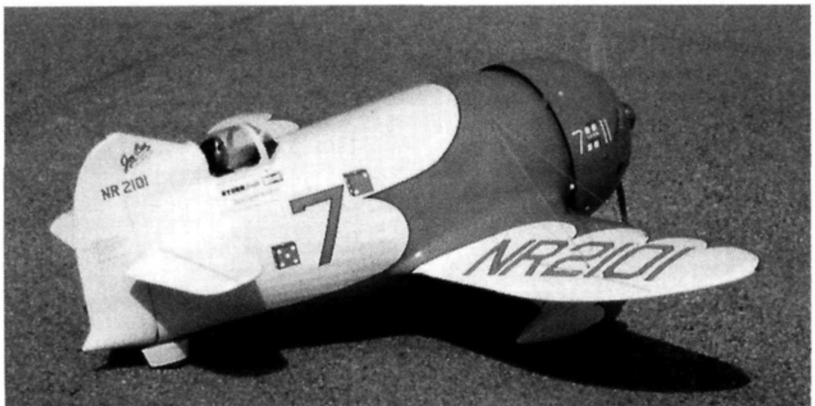
The provided arrow shafts are used as a jig to assist with construction; holes for the shafts have been cut in the wing ribs. Balsa blocks are fastened to the workbench to support the arrow shafts, which are secured to the blocks. To obtain the correct wing washout, be sure to make the blocks exactly the same size as those shown in the manual. Take care not to glue the shafts to the ribs during construction.

uper Sportster

I made two minor changes in the wing construction:

- I used hardwood rails in place of the balsa/plywood rails supplied for the aileron servo mounts.
- I laminated 1⁄16-inch-thick lite-ply doublers to the wing ribs in the area of the servo mounts. After installing the servo, I made a hatch cover by gluing 1⁄4-inch-square spruce around the hatch-frame opening. Then I installed a 3⁄32-inch-thick lite-ply hatch cover using no. 2 screws.

My only other minor change to the construction was the lamination of 1⁄32-inch-thick plywood to the end rib, which butts against the fuselage. If you follow the steps given in the manual, you will find this wing a snap to build.



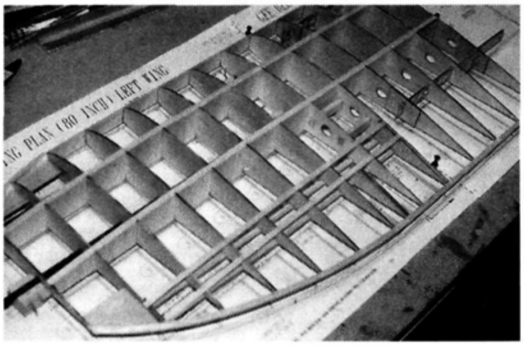
SPECIFICATIONS

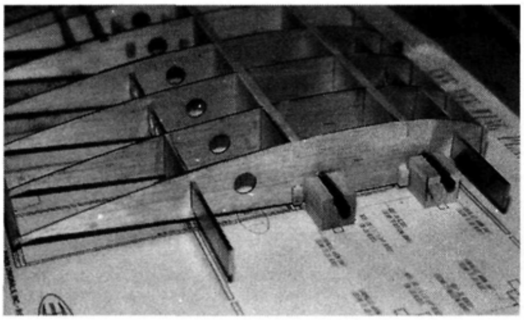
Manufacturer: Byron Originals
Model name: Gee Bee Super Sportster
Type: 1⁄4-scale, IMAA-legal racer
Wingspan: 80 in. (75 in.)
Length: 56 in.
Radio used: JR 347 PCM
No. of channels req'd: 4 or 5 (aileron, rudder, throttle, elevator; one for optional smoke system)
Fuselage construction: one-piece fiberglass
Wing construction: built up and sheeted
Weight: 24 to 25 lb.
Engine req'd: 3.7 to 4.2ci
Engine used: Zenoah G-62
Prop used: Zinger* 22x6-10
List price: $729.95 (Deluxe kit)
Options available: G-62 engine with PurrrPow'r mount ($630.15); mock radial engine ($31.45); flying wires ($10.45)
Features: full-size paint-scheme templates help you to paint the model like the "real thing"; one-piece fiberglass fuselage, fiberglass rudder, wheel pants and strut covers; laser-cut parts.

Hits
- Laser-cut wing parts and fuselage formers fit perfectly.
- Wing construction was fast and accurate.
- Complete hardware package.

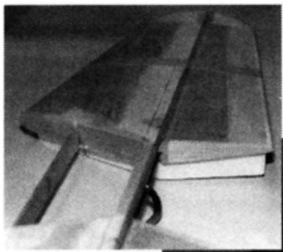
Misses
- If there are any, I missed them!

- **Stab and elevators.** Stab and elevator construction is a simple matter of sheeting the foam-cores then adding the leading- and trailing-edge planks, followed by the tip blocks. The completed structure is sanded to shape and, when completed, the elevators are cut out using the templates provided. Add the stab trailing edge and the elevator leading edge and sand to shape. Follow the manual for fast and easy construction.


Left wing panel being framed.

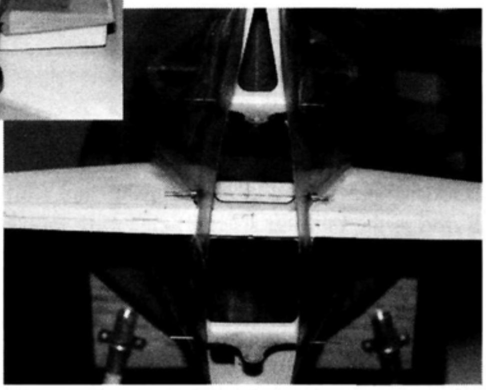

The wing panel end. Note the blocks under the arrow shafts used to hold assembly off the work surface.

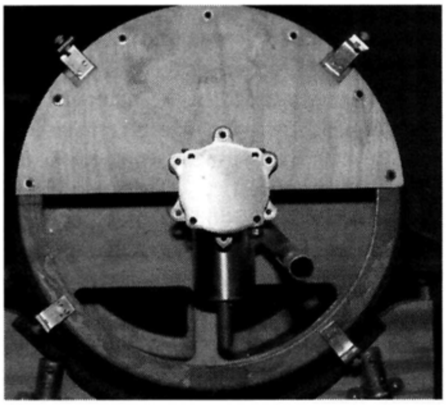
- **Fuselage.** The Gee Bee's large fuselage diameter makes it easy to install the formers. Aluminum extrusions are mounted on the front and rear main formers to accept the aluminum spars, which must first be installed in the wing. Steps 6 through 15 of the fuselage construction should be followed without deviating.


Completed stab and elevator prior to their installation in the fuselage.

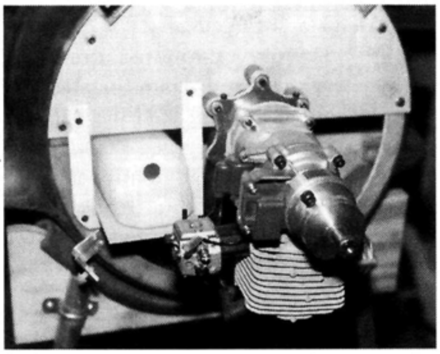
Add the interior cowl ring after the main spar installation has been completed. The manual calls for this ring to be epoxied into place, but I also glassed the ring into the fuselage as I did with the other formers. Steps 18 through 21 outline the landing-gear mounting-block installation, which was accomplished without problems. Make the landing-gear struts and wheel pants at this time. I completed the struts before I installed the landing-gear blocks so that I'd be able to check the gear alignment before glassing the mounting blocks into place. Mount former F-1—the front engine-mount former. Step 24: at this point, I recommend that you turn to the section on page 18 that tells how to install the engine, and install the engine before you mount the cowl.

- **Engine installation.** I used a PurrrPow'r mount with a Zenoah* G-62 engine in my aircraft. You can buy a G-62 with the mount, a spring starter and a custom throttle linkage installed. I did not use a spring starter on this engine, but I did install a Jump-Start system from CH Electronics*. This unit does not add any weight to the aircraft because it doesn't require any additional onboard batteries. A small lightweight module is installed in the aircraft, and a pulse switch is mounted on the engine next to the flywheel. Power for the Jump-Start comes from four AA batteries; plug them into it, and start your engine.

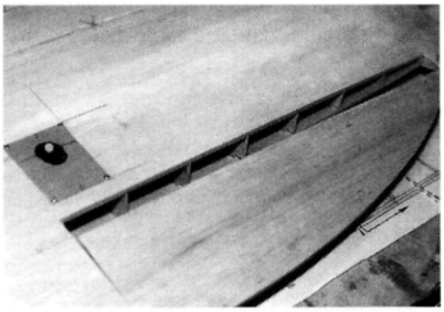

The rear former and stab being installed. Note the three pieces of wire used to position the rudder post. Wheel collars hold the fuselage sides against the post while the post is being glassed into place.



The front engine former is installed with PurrrPow'r mount in place.



The engine on the mount. Note the fuel tank's position.



The bottom of the wing panel with the installed servo and the aileron cutout.

FLIGHT PERFORMANCE

I asked my friend Tom Walker to be the test pilot because he had flown the Byron prototype. With a light breeze blowing down the runway, it was a great day to test-fly the aircraft.

• Takeoff and landing

A few high-speed runs down the runway are recommended to get the feel of the right rudder input. On the first attempt at a takeoff, the aircraft caught a wheel in the right side of the runway, rolled over and broke a prop. For the second attempt, a little right aileron was trimmed in; takeoff was right down the center line. Tom climbed to a safe altitude and reduced the power to 75 percent. A little down-elevator trim was required, as was some additional right aileron.

Much of the first flight was spent preparing for landing. We tried a number of approaches to see which type would result in a good landing. When the aircraft was flown toward the runway at a reduced speed, we could see that it had a high sink rate, but the control response was positive. If power had to be applied, the aircraft would continue to sink until sufficient speed had been built up. Tom kept the speed up with about ⅓ power until the Gee Bee was about 4 inches above the runway. At that point, power was reduced to idle, and elevator was applied *gently* to complete a perfect wheel landing.

• High-speed performance

The Gee Bee is in its element when flying fast. The control responses are very effective, so during your first few flights, be careful to avoid making inputs overzealously. To avoid the deadly accelerated high-speed stall, remember to limit your elevator throw.

• Low-speed performance

The plane is very stable in the low-speed configuration, but it will sink quickly when power is reduced. Because of its large radial engine and fat fuselage, the Gee Bee has a bit of drag to overcome when it's accelerated from a low speed, so you need to plan accordingly. Don't pull back the throttle too much on a low-altitude pass because with the high sink rate and the slow acceleration rate, you might find your plane in the ground.

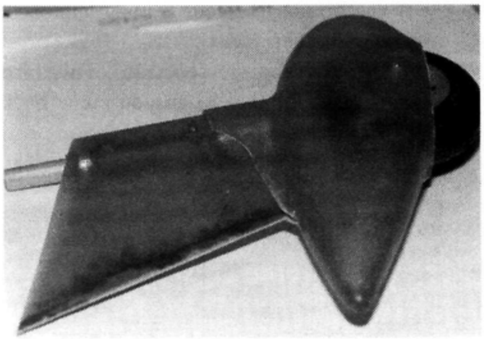
Having trimmed it for hands-off flight, we attempted a power-off stall: reduce the power and start to bring up the nose; the aircraft stalls straight ahead showing no tendency to snap.

• Aerobatics

Rolls, point rolls, loops, split-S's, flat turns and stall turns were no problem for the Gee Bee or Tom. The aircraft flew so well that Tom's Dad, Bob, took a turn at the sticks. After my nerves had calmed down, I took a turn as well. Again, all went well until the final flare, at which point, I ballooned the aircraft slightly; it came down hard on one leg and broke one of the gear struts (no damage to any other parts, not even the wheel pant).

• **Fuel tank.** I mounted the fuel tank on a removable platform between the front engine-mount former and the forward wing-mounting former. After the engine has been installed, the cowl installation can be completed.

• **Rudder and stab.** Again, follow the sequence given in the manual. The elevator control horn must be put into place in the fuselage before you glass the rudder tail post into position. Install the swivel link on the control horn before you install the horn in the fuselage.

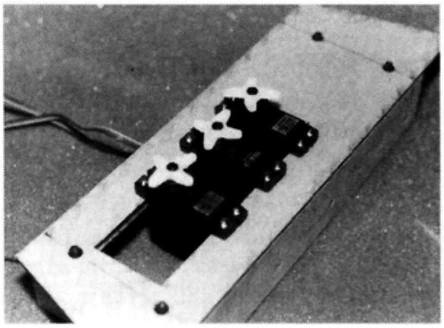


The completed wheel and pant assembly.

The addition of the canopy, cockpit and tail-wheel fairing completes the basic construction. I added a 9-cylinder mock radial engine to the cowl and drilled all the holes necessary for the flying-wire kit at this time.

FINISHING

Before painting them, I covered the wings, stab and elevators with 0.06-ounce fiberglass from Dan Parson Products*, and I checked the aircraft's weight and balance before priming it. Without the engine, it weighed 14¼ pounds, and it weighed 21 pounds with the engine, the mount and the fuel tank.

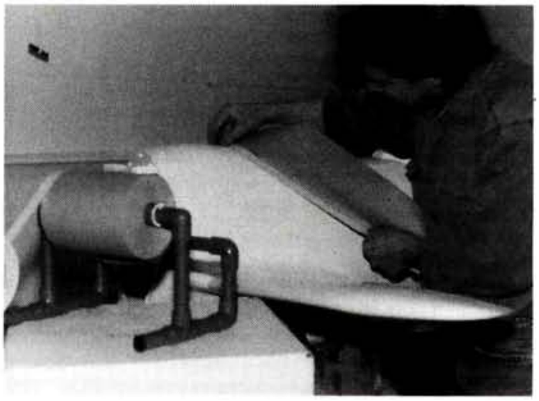


The equipment board with the servos being installed.

Prior to being painted, when balanced according to the method outlined in the manual, the aircraft was nose-heavy.

The aircraft is finished in base coats of red and white automotive paint enamels and a top clearcoat. The kit includes full-size templates that eliminated a lot of work when masking the red scallops. First, the

entire aircraft was painted white, and when that had dried, the templates were used to outline the areas to be painted red. Using a tape machine from FP Model Products*, I masked off the area that would remain white and then applied the red paint. Then, before applying the clearcoat, I applied ⅛-inch, black, auto pinstriping tape and the Model Graphics vinyl graphics (decal sheet included).



Masking tape is being applied to the white aircraft in preparation for the red trim. The FP masking machine is being used by Don Winn.

An aircraft needs a pilot, so I added an MGA Pilots* sport-pilot bust to the cockpit. (As a point of information, MGA now has available a ⅙-scale full-figure pilot in civilian, WW II and jet, and it fits all the Byron warbirds.)

To complete the model, I used a Tru-Turn* aluminum spinner.

THE RADIO

After completing the painting, I assembled the aircraft without installing any radio equipment in the fuselage. In each wing, I installed a JR* 4721 servo with all the associated linkages for aileron control, and I also installed the pilot, prop and spinner. When checked again, the balance was found to be perfect—slightly nose-down, so the rest of the radio equipment went right on the CG.

• **Installation.** To install the JR 347 PC radio system in the desired location, I had to remove the engine, mount and front engine former. I prepared a removable equipment board, which holds the elevator, rudder, and engine servos as well as the receiver. I use four JR servos—two 4721s for the elevator, a 4721 for the rudder and a 517 for engine control. Using five, 4-40x⅜-inch bolts and blind nuts, I attached the equipment board to the rear of the front former and then mounted a JR 1800mAh 5-cell battery pack just below the equipment board.

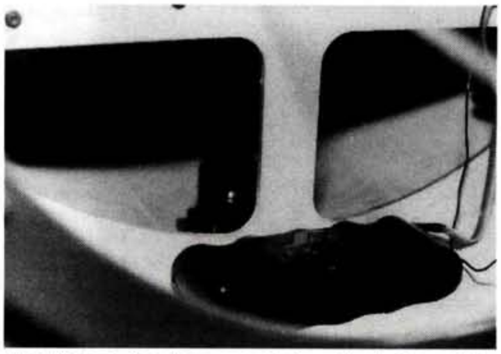
• **Rudder travel.** I was told that the Gee Bee might be rudder-sensitive. The rudder travel recommended in the manual is ¾ inch in both directions, which is much less than Byron usually recommends for their aircraft, so I decided to install a JR NEJ 1000 gyro—a state-of-the-art unit with no moving parts—on the rudder. I mounted it on the bottom center of the fuselage at the CG. It's controlled by the "AUX 1" channel, which allows me to set the gyro's gain from the transmitter. A gyro helps to correct for unwanted yaw by moving the rudder in the opposite direction.

Having completed the radio installation, I again installed the engine and checked the balance. The aircraft balanced slightly nose-down at the indentations on the fuselage. The total ready-to-fly-weight of the aircraft—without fuel—was 23 pounds.

FINAL THOUGHTS

The Gee Bee is a real showstopper, and it's very stable in the air.

• I recommend that you test-fly your Gee Bee on a calm day at a large field so that you'll be able to make long approaches.



The JR gyro has been mounted on the bottom of the fuselage. The battery pack was secured to the lower part of the former.

• Set the servo travel exactly as stated in the manual. Set up low rate on the elevator at about ⅜ inch up; and switch to low rate on final.

• If you do not like your landing approach, go around again.

• On final, keep the speed up. This bird slows down quickly when you come back to idle.

Remember, big is better!

**Addresses are listed alphabetically in the Index of Manufacturers on page 135.* ■

PILOT PROJECTS

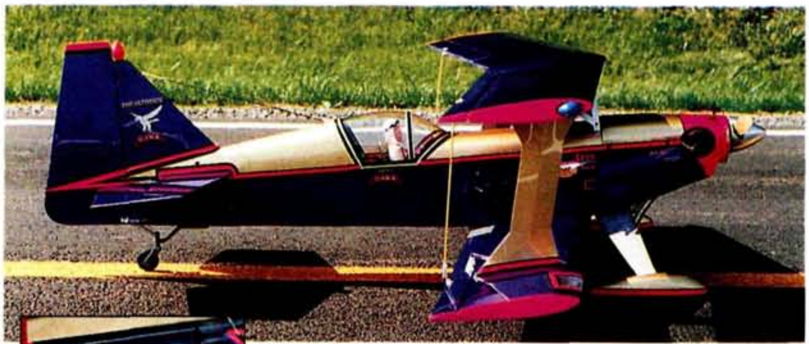
A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1995. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.



LIGHTS OUT!

Dan Stapleton of Chesapeake, OH, wanted to be able to fly after dark, so he spent four months designing a lighting system for this 54-inch-span Goldberg Ultimate. He uses special lenses and bulbs in the wings to produce two main beams for takeoff and landing; green, blue and red running lights help him to recognize the position of the model during flight. Because they're powered by a separate battery pack, the lights will last for 1 hour and 15 minutes. Dan says, "There's nothing more fun than flying late in the evening when everyone else has quit because of darkness."

FOREST FIREFIGHTER

Vince O'Brien of Weippe, ID, scratch-built this sport-scale Canadair CL-215 from Steve Gray plans. The 76-inch-span model weighs 9½ pounds and is powered by two Magnum 25s. Vince used Century 21 film to cover the plane, and the color scheme and markings are from Bob Banka Scale Model Research materials. The Canadair also has flaps and a selectable differential throttle for maneuvering on the water.

SCOURGE OF THE SKIES

Joe Parrott of Knoxville, TN, used Joseph Nieto drawings to scratch-build this 84-inch-span Fokker DVII. He covered the 17-pound, balsa-and-ply model with Superfabric and then hand-painted the lozenge pattern and all the markings using vinyl screen-printing ink; he then antiqued and fuelproofed it. The 8-inch wheels are from a wheelchair; Joe glued on wooden spokes and then covered and painted them. The tires are made of radiator hose. The dummy Mercedes 6-cylinder, in-line engine and the hand-carved basswood pilot figure are scratch-built. Joe says that his Fokker "flies and handles like a big ol' pussycat."

FIGHTER ON FINAL

This modified Bud Nosen kit was built by Nestor Marty of Boston, MA. The 25-pound P-51 is powered by a Zenoah 62 engine and has Robart retracts and handmade tail gear. The model is covered with MonoKote and paint. Nestor says that he spent 1½ years building it.

PILOT PROJECTS

TEXAS THUNDERBOLT

This P-47 is the handiwork of Keith Sparks of Fort Worth, TX. He scratch-built the model using *Model Airplane News* plans (designed by R.L. Schellenbaum) that he reduced on a copier. The 3-foot-span, 2-pound plane uses microservos and is powered by an O.S. 20. Keith painted the fiberglass cowl and the checks using Red Baron paints, and he covered the rest of the model in MonoKote. Keith says that the other fliers at the field tease him because the letters on the side of the model appear to say "fast"; he claims that this was an oversight on his part, but we're sure it's accurate!

SHOOTING STAR

Jeff Green of Lansing, MI, scratch-built this F-104 Starfighter model using Bob Holman plans, canopy and foam-core wings. He modified the plans slightly to include landing gear of his own design and tip tanks. The 36-inch-span model is 72 inches long and weighs 9 pounds, 4 ounces ready to fly. He covered the model with K&B cloth and Z-Poxy resin and used Perfect Paint to create the camouflage markings. Jeff says that the model is very fast—75 to 90mph—at ¾ throttle, and that it flies well at slow speeds with and without flaps.

CONNECTICUT CLASSIC

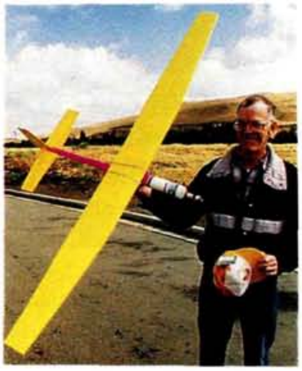
Jim Anton of Waterbury, CT, scratch-built this 1935 Reliant SR-5 using plans from Vintage R/C. The 84-inch-span model is powered by a Zenoah G-23 engine and controlled by a Futaba Conquest 6-channel radio. He covered the Reliant with Sig Coverall fabric and nitrate dope and finished it with automotive BASF Solo acrylic urethane. Jim says that the plane made its debut flight at the Nutmeg R/C Flyers Club field in Thomaston, CT, where the model handled and flew well at only ½ throttle.

RIVETING CATALINA

Bill Murray of Forked River, NJ, used Vintage R/C plans to scratch-build this 108-inch-span PBY-5A. The model has more than 7,000 rivets (pin heads) and 120 feet of panel lines (1/64-inch-wide drafting tape), which were added after two coats of primer and prior to aluminum paint. Bill spent 5 years on this project, averaging 3 hours a day in his workshop. When the PBY isn't in the air, it sports scale dummy engines (each containing more than 300 pieces) and props that Bill designed and built.

BAT AND BOTTLE SOARER

What do you get when you combine a plastic softball bat, a Drifter wing and tail feathers and a soda bottle? James Seibert of Pleasant Hill, CA, says, "a glider, of course." The unusual craft is powered by a Cox .049 and controlled by a Futaba 2-channel radio, and its CG can be easily adjusted by sliding the bottle forward or aft. James tells us that the plane has had more than 100 flights.



EARLY AXIS

Model Airplane News columnist Jim Newman sent this photo of his Messerschmitt 109 "just to prove that I occasionally do manage to get into my shop to disfigure some balsa." Twelve 1400 cells power an Astro 25 geared motor, which in turn drives the 11x8-inch propeller. Jim designed the cooling system so that air comes up through the oil cooler intake in the nose, is ducted 90 degrees via thin cardboard baffles, is then directed out under the pilot figure and up the sloping cockpit bulkhead (again via thin cardboard baffles) and exits through the canopy behind the pilot figure. The pilot, which weighs almost nothing, is sculpted of blue foam and painted with acrylic colors.

CONSTRUCTION

ELECTRIC DORNIER 335

A scale, in-line, twin fighter

by AL MASTERS

I've been involved in the hobby since the mid-'30s, primarily as a designer/scratch-builder. My interests seemed to center on building models that were classified as "different" by my modeling peers.

It wasn't until I had the pleasure of watching Keith Shaw fly his state-of-the-art electric models, that I became aware of what was going on in that phase of the hobby. As I watched Keith's 10.5-foot-span, four-motor King Crimson Flying Wing and his ever-popular twin-motor deHavilland Comet knife through the air in majestic, silent flight, I was hooked. I decided that my first electric modeling project would be the Dornier-335 Arrow.

The Arrow was a German twin-engine fighter/bomber built too late in the war to see operational duty. I decided that I would build the Do-335 electric to scale outlines with retractable tricycle landing gear; a bungee-launched or gearless version of the 335 just wasn't my cup of tea!

DORNIER-335 ARROW ELECTRIC TWIN

In 1962, I received scale drawings and photos of the plane from Dornier, and to date, I have designed three sets of scale plans for this unique aircraft. Though these models are glow-powered, reliable performers, converting them to electric involves more than adding a few Ni-Cd cells and electric motors!

I decided to convert my ⅛-scale Do-335 because it had a wing area of about 1,000 square inches, and its weight could be handled by the three Spring Air* retracts that I wanted to use.

First, I perused stacks of old model magazines and really scrutinized those articles on electrics that I had previously skipped. I picked an article by Keith Shaw (*Model Airplane News,* December 1991) about the Electric Twin to be my guide.

I chose a maximum wing loading of 24 oz./sq. ft. which meant that the finished model could not weigh more than 10 pounds. My ⅛-scale, glow Do-335 weighs 14 pounds, so I had to eliminate 4 pounds if I wanted it to do more than just taxi around! To lighten the airframe, I had to cut many lightening holes, so I took much greater care selecting my wood and construction materials than I usually do.

I decided to eliminate ply firewalls and to use 4- to 6-pound balsa. The wing and stabilizer spars would be medium-hard balsa, but the main wing spar would be ply to carry the landing-gear loads. To reduce drag and to make the wing thinner and lighter, I chose the NACA 4412 airfoil, which would still hide the retracted wheels. I eliminated flaps, thereby eliminating one servo.

I replaced the sheet balsa and fiberglass/resin skins with a light iron-on covering material over open-bay stringer construction. My choices were clear MonoKote or primed micafilm, because either could be painted with Cheveron* WW II camouflage colors.

Next, came motor and speed control selection. I zeroed-in on two Astro* Cobalt 15G, sport-scale geared motors. The motors would be wired in series with 24 Sanyo* 1400mAh cells. The available data indicated that a 6.5-minute running time could be expected and that with the Astro 205 speed control, flight times might be increased! This would work out to a power loading of about 50 watts per pound, provided that the model could be held to the target weight of 10 pounds. I had to estimate the weight of the wire that feeds the motors, and it turned out to be somewhat of a surprise! The 335's fuselage is as long as the wing and with a motor way back on the tail, the total weight of the Sermos* connectors and wire to feed both motors would be 7.5 ounces—ouch!

At this point, all the preliminary engineering and weight estimates had been completed and it was time to get serious! I ordered the 4- to 6-pound balsa, two Astro 15G motors, 10 feet of 13-gauge wire, eight Sermos connectors and 26 Sanyo 1400mAh SCR cells (a couple extra!). Oh, yes, I also ordered a charger for up to 36 cells. After all these purchases, it was too late to back out of this project! Referring to another article by Keith Shaw, (*Model Airplane News*, August 1993), I made a 24-cell Ni-Cd pack. I followed Keith's instructions closely, and the 24 series-wired cells came out to the predicted 3 pounds—right on target! I completed the first prototype airframe and covered the bare bones with primed micafilm.

SPECIFICATIONS

Scale: 1/8

Wingspan: 70.5 in.

Wing area: 1,006 sq. in.

Flying weight: 10 lb., 2 oz.

Wing loading: 23.2 oz./sq. ft.

Power: (2) geared Astro 15Gs with 28 1400mAh Sanyo SCR cells

Speed control: Astro 205

Retracts: Spring Air model no. 202HD with 3-inch Kavan wheels

Finish: clear MonoKote, Cheveron paint, MonoKote trim sheets

Flight times: 5 to 8 minutes (depending on use of speed control)

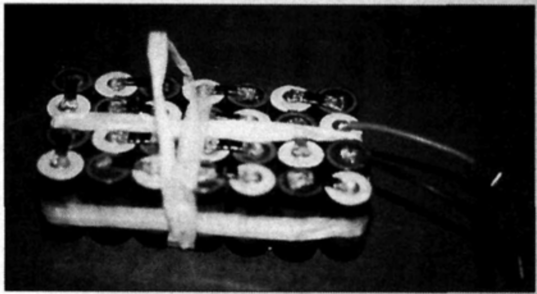
CONSTRUCTION

Use a ball-point pen and carbon paper to trace parts onto the sheet material. Balsa ply consists of two laminations of 4- to 6-pound balsa sheets. One-eighth-inch balsa ply consists of two layers of 1/16-inch, laminated balsa sheet. Trace the part on the first sheet and cut it out, but skip the notches and the center section cutouts. Add the second layer at a 90-degree angle, cross-grain to the first. The second layer can be made of scrap balsa and need not include the centers that will later be removed to provide "lightness." For bonding, I used CA.

The stringer notches can be cut when the stringers are placed, and the bulkhead centers can be removed after assembly. I used a round hacksaw blade with one end eyelet removed. Prior to assembly, cut out wing part W1 and fuselage part F10 and drill them for the two 1/4-inch wing dowels. The fuselage ply beam is outlined with triangles on the fuselage plan. Trace (or draw) the outline on 1/16-inch ply. It is possible to tape two blank 1/16-inch plys together and cut both out at once.

FUSELAGE

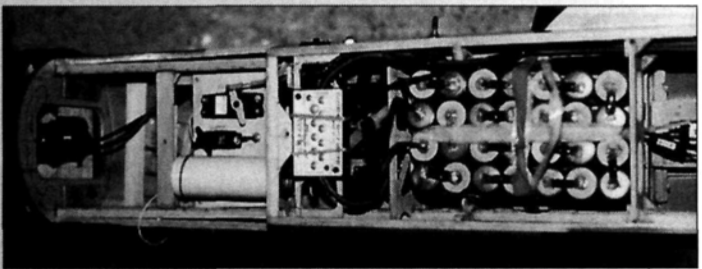
Protect the crutch layout with wax paper, and pin the 1/4-inch-square balsa crutch in place. Add the aft motor-mount base to the top of the crutch. (CA is good enough!) Install the bulkhead, but insert scraps of 1/16-inch balsa in the crutch area to make the slots for inserting the 1/16-inch-ply fuselage beam. You'll need to remove these scraps later, so don't glue them to the crutch and bulkhead. Place wax paper glue barriers between hatch members that will later be separated. Note that the backbone is made of two 1/8- x 1/4-inch balsa sticks that are attached separately. The first stick is glued in place to establish the curve without putting too much stress on the bulkhead structure. The second piece is added and glued over the first. For rigidity, add stringers and ply canopy frames. Build in the two hatch holds. Saw through the backbone to separate the canopy hatch. Remove the 1/16-inch balsa scraps from the crutch area, and take the upper fuselage from the building board. Clamp and glue the two 1/16-inch-ply beams in the bulkhead slots, alongside the crutch. Add the front firewall (FFW) and the lower bulkhead sections, stringers, etc. Resist the temptation to use hard-balsa stringers, because the additional weight will be excessive. When you're ready to fit the aft motor in place, attach it to its 1/8-inch-ply mount. It can then be passed through the aft cowl ring and held in place with two 4-40 bolts and blind nuts that are in the 1/8-inch-ply mount.



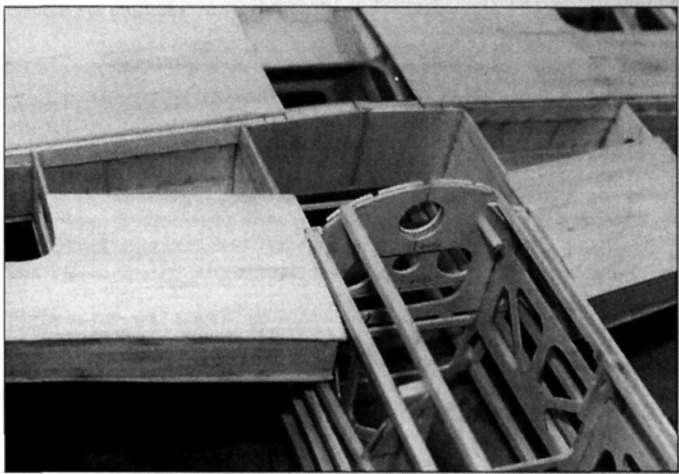
Battery pack—28 1400mAh SCR cells. This fiberglass tape handle allows easy removal. If placed on a metal surface, it will "self-destruct!"

WING

Trace and cut the wing parts. Glue the 1/16-inch-ply rib doublers (3A and 3B) to their respective ribs so that there is a right and a left set. Use 1/4-inch-square medium-hard balsa to make a complete lower spar (including the ply dihedral brace W2). Note the spar section change after rib 4.



Both hatches have been removed to show the 28-cell pack, the Astro 205 speed control, elevator and gear servos with air tank.



The partially completed wing has been bolted to the fuselage so that WI can be positioned. The holes for the two wing dowels were drilled before assembly.

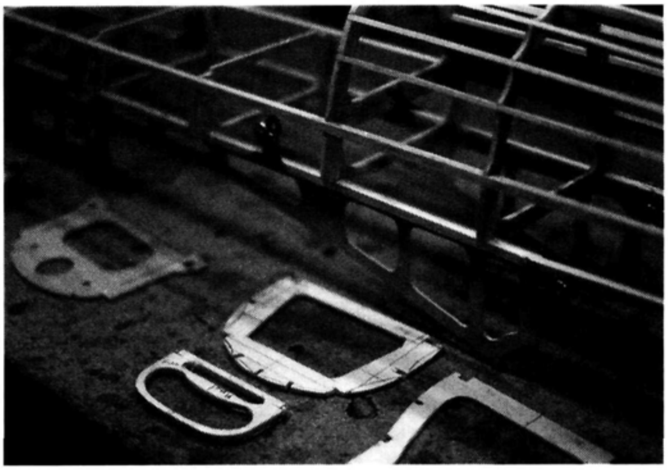
The front hatch and canopy hatch have been completed and removed from the crutch.

Pin the lower spar over the wax-paper-protected plan. The NACA 4412 airfoil is slightly under-cambered, so the lower spar should be raised slightly off the building board to fit the ribs correctly. Add the pre-tapered sub-leading edge, sub-spars, aileron sub-spars, tip frames, etc.

It wasn't necessary to build in tip washout on the electric 335. There is a scale "stall breaker" at the root leading edge (LE) inboard section. The 3/32-inch trailing-edge sheet can be slid under the ribs and glued. *Do not try to install W1 at this time.*

After the spar has been placed over the plans and the partially completed first half has been supported off the building board, build the second half of the wing as you did the first half.

Rough-cut two leading-edge blanks from light-balsa-plank stock. After you've added the 3/32-inch sheet balsa to the wing, tack-glue the leading-edge blank to the sub-LE. Strips of masking tape placed over the LE sheet balsa will protect it when the LE is shaped and sanded. Shape the LE and remove it. Using the round hacksaw blade and sandpaper dowels, remove most of the sub-LE from between the ribs. Then, remove most of the wood from the LE by gouging out the rear center. Make sure that both LE pieces are the same weight, and re-glue them in place.



The upper fuselage has been removed from the building board, and the fuselage ply beams have been clamped and glued to the inside of the crutch.

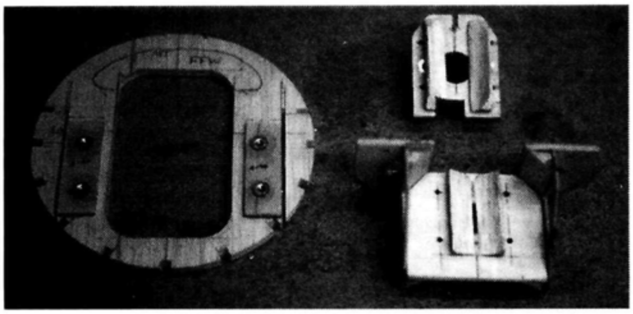
Fit and bolt the partially completed wing to the fuselage, and fit Wl in place. The slot in rib 1 is oversize to allow the fitting and adjustment of wing part Wl to the fuselage bulkhead F10. Insert two 1/4-inch dowels for alignment. Add the tri-stock supports for Wl. Remove the wing, and complete the rest of its construction.

TAIL GROUP

The stabilizer and lower fin are built over sheet-balsa cores. Remove the core material from the ribs prior to covering. The upper tail assembly can be removed for covering, transport and access to the aft motor. The rudder servo is connected to the lower rudder horn, and rudder action is transferred to the upper rudder by a 3/32-inch-diameter torque rod. A ply-reinforced slot in the upper rudder traps the torque rod snugly.

RETRACTS/STRUTS/WHEELS

The heavy-duty Spring Air retracts (part no. 202HD) that I chose are made for 3/16-inch struts. To save weight, I didn't use shock coils, and I changed the main-gear struts to 5/32-inch music wire. I slipped a 1-inch section of K&S* brass tube over the 5/32-inch music-wire strut to bush it up to fit the 3/16-inch retract pivot block. A flat notch through the brass and into the 5/32-inch music wire (for the setscrew) maintains the strut orientation. I made fiberglass strut covers out of one layer of 6-ounce cloth with resin. Each main-

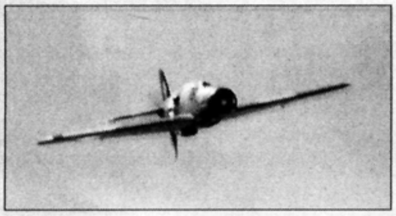


The front firewall (FFW) with homemade front and aft motor mounts.

FLIGHT PERFORMANCE

• Takeoff and landing

For any first test flight, remember that when the runway is behind the plane, it is of no use to you. Turn on the arming switch, and you're ready to go! Apply power slowly to achieve full throttle. Slight elevator back-pressure will result in a solid climb-out as the gear is retracted. Enter the landing pattern, and drop the gear on final. A slightly nose-high landing attitude will protect the nose gear, and a solid touchdown on a smooth runway is no problem. The 10-pound model with 3-inch wheels touching down on a grass runway may cause some bending of the gear struts, so a check of the gear before the next flight is always prudent.

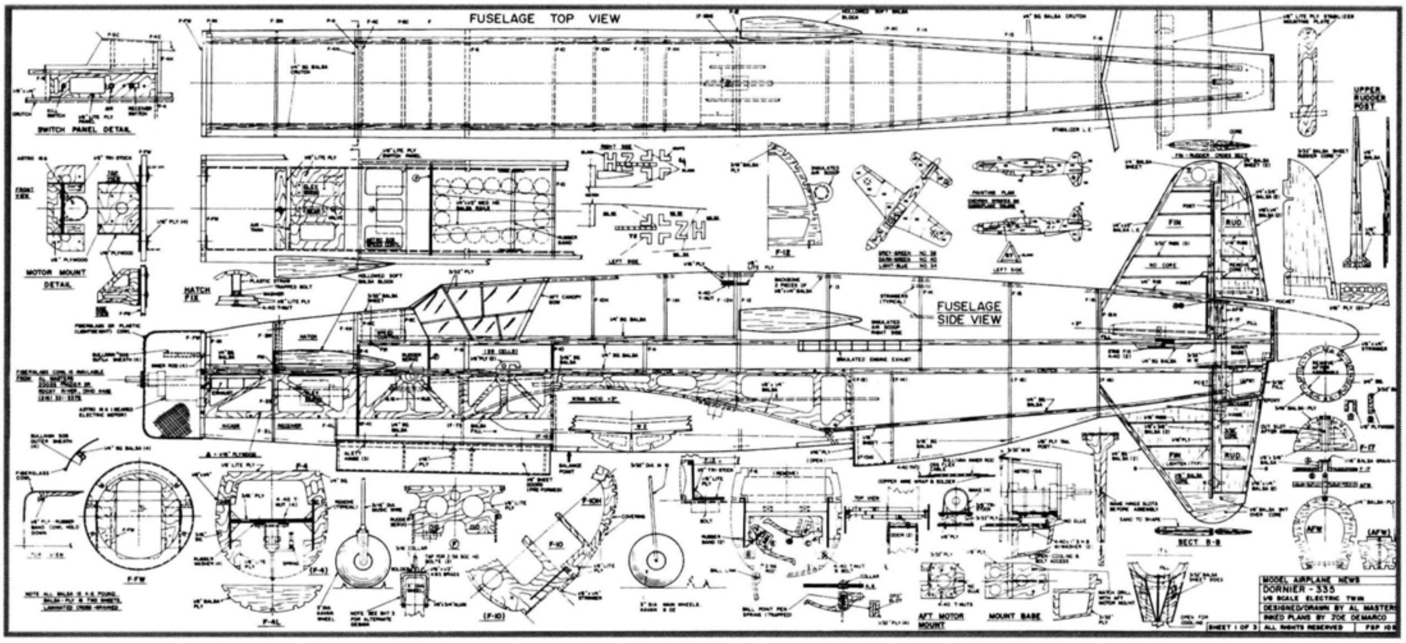


• High- and low-speed flight

The throttle can be "full" for the whole flight but not without some drawbacks! Full-throttle flight is a real temptation because the model really "tools" (WW II term). But one drawback is that full-throttle flight time will be half of 1/2-throttle flight time. The plane will hold altitude at reduced throttle. Just crank in some up-trim, and make sure the gear is retracted. Save some juice for a taxi back to the pit area after landing.

• Aerobatics

Plenty of power was available for rolls, a loop and four flybys.



ORDER THE FULL-SIZE PLANS...SEE PILOTS' MART, PAGE 140.

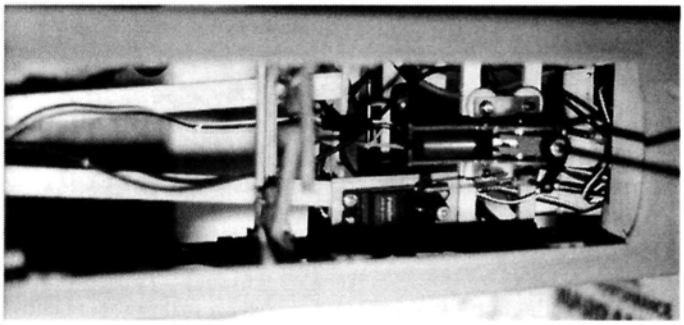
gear strut (with cover and with a 3-inch Kavan* wheel) weighed 2.5 ounces. To correct for the wing dihedral, I shimmed the 90-degree main units with washers at the outboard mounting screws. If you prefer 85-degree mains, they're available from Spring Air.

The nose-wheel retract unit is "belly-mounted" to 3⁄16-inch ply with four rubber washers or doorstop rubber bumpers, which are available at hardware stores. Four 4-40 bolts pass through the rubber washers and into blind nuts. The 3⁄16-inch music-wire strut (without shock coil) is connected to an aluminum wheel fork that fits the 3-inch Kavan wheel. The nose-wheel door operators are an assembly that is held to F7 with two 4-40 bolts and blind nuts. The bolt slots make it possible to adjust the door.

COWL

The plans show a lightweight cowl (one layer of 6-ounce fiberglass cloth with resin) held to the FFW with four pieces of Sullivan* inner and outer nyrod—part no. 505. Two rubber bands hold the cowl in place, and the unit is easily removed, flexible and not damage-prone! A 6-inch-diameter plastic food container could also be used as a cowl.

The front motor mount is strong enough to withstand normal running/flying loads, but it is designed to fail during "unplanned nose-first mishaps." The balsa FFW is easily repaired, whereas a bent motor shaft has to be replaced!

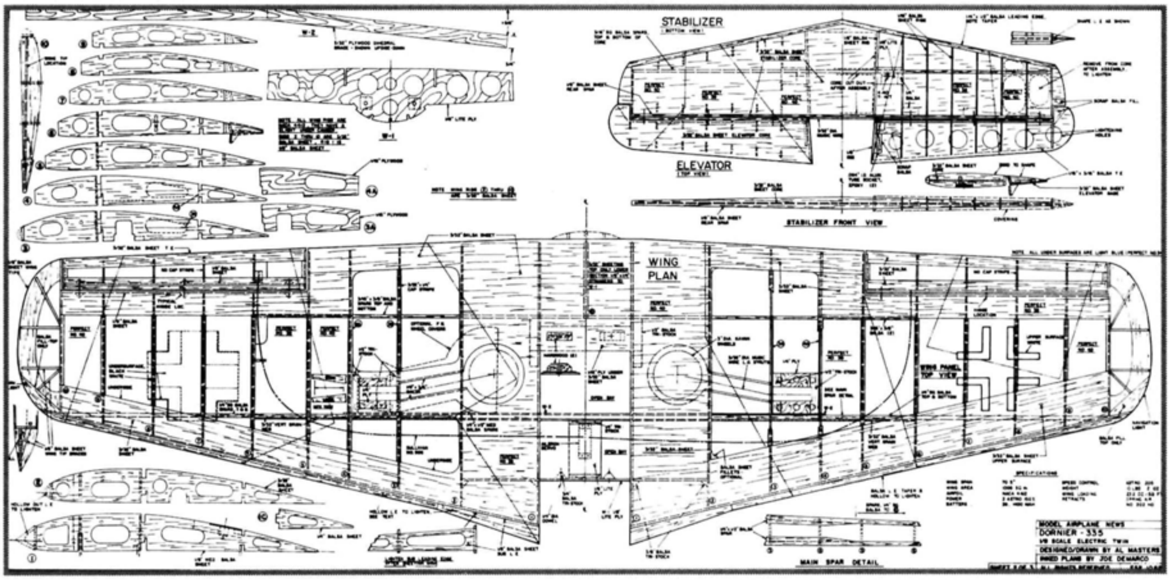


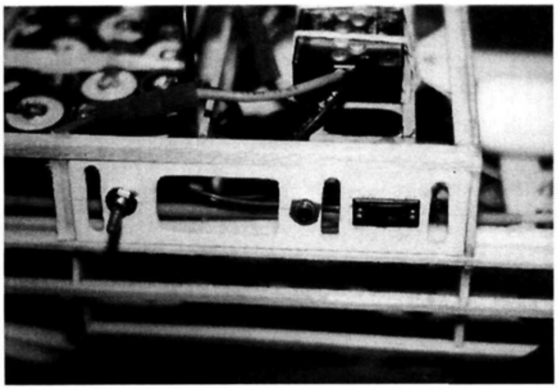
To save weight, no shock coil is used on the 3⁄16-inch, music-wire nose-gear strut. The Spring Air retract unit is "belly-mounted" to a 3⁄16-ply member. Four 4-40 bolts pass through thick rubber washers and into blind nuts.

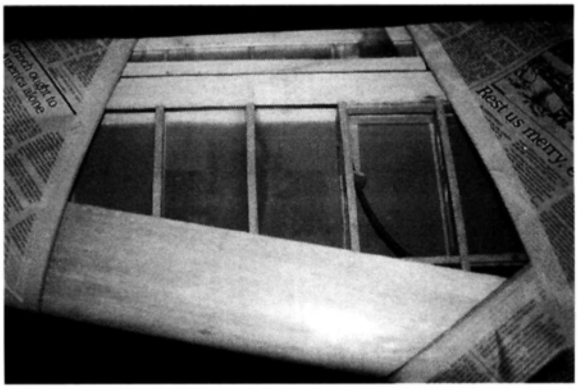
SPINNERS/PROPELLERS

For cooling, leave off the aft spinner. If you want to fly with the aft spinner, install additional cooling outlets alongside the upper rudder and elevators. For the front prop, I made a super-light spinner out of a L'eggs™ pantyhose container.

I haven't experimented much with propellers, so I used standard 11x8 Zinger* propellers on both electric 335s. I've







Left: the fuselage panel with arming switch, air-fill valve and receiver switch. Right: a section of the upper right wing panel with aileron has been masked and is ready for a camouflage color. The clear MonoKote has been wiped clean with acetone prior to spray-painting.

always used a pusher prop with the same pitch as the tractor prop (front), so that torque from one motor would cancel out torque from the other and vice versa. You can use two tractor propellers if you reverse the aft motor rotation by changing the aft wire polarity. But I haven't tried this, because it would double torque, thereby eliminating the torque-canceling advantage of the push/pull propeller arrangement.

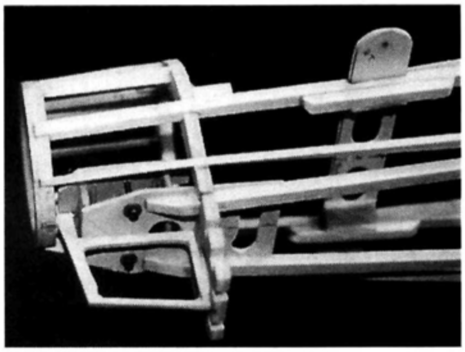
The same model powered by two geared Astro 25s and 32 cells, would weigh about 17 ounces more (including a change to 3/16-inch main-gear struts), and the wing loading would increase to 26 oz./sq. ft.—not too bad!

COVERING/FINISHING

I covered the model with primed micafilm using Balsarite*. I masked the camouflage pattern with drafting tape, which isn't as adhesive as regular masking tape, so it minimizes undercoat pull-off. I covered another Do-335 with clear MonoKote that I rubbed down with acetone prior to masking and painting. I allowed three days for drying time between colors after I had removed the tape. I used MonoKote trim sheets for insignias and exhaust simulation. Light coats of Cheveron camouflage colors (gray-green—part no. 38; dark green—no. 40) went on nicely. All under-surfaces were done in Cheveron light blue no. 34.

ELECTRICAL

The design accommodates four commercially made 7-cell packs, but these cost more and don't cool as efficiently as the 28-cell homemade pack. I used no shrink-wrap on the cell pack, only a minimal amount of fiberglass tape. The pack is held in place with rubber bands.



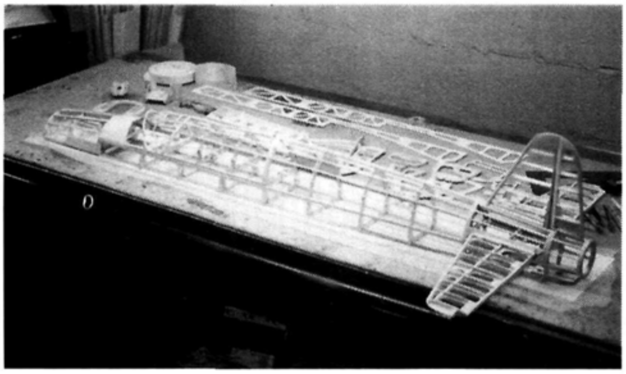
The aft motor mount—trial-fitted and bolted into place.

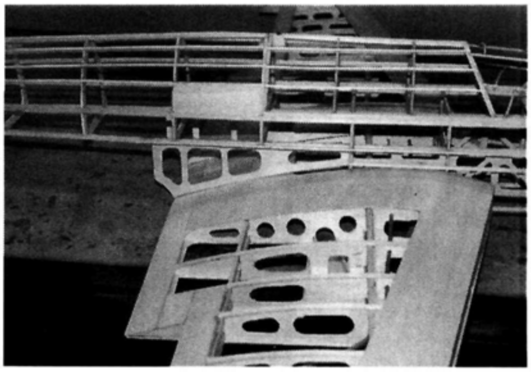
I used an arming switch from Radio Shack (part no. 275-1545). To handle the 20A current, I wired two switch terminals in parallel, and I wired a 25A in-line fuse into one line for protection. I used Sermos connectors for disconnects and 13-gauge motor wire.

I used three standard servos for flight controls and a microservo for the retract valve. A separate 600mAh Ni-Cd flat-pack was used for the receiver. In addition to the two factory-mounted capacitors on the Astro 15Gs, I added an additional capacitor between the brushes. (Keith Shaw suggests a capacitor from Radio Shack—no. 272-160.) There has been no indication of "in-flight glitches." During initial motor tests at home, I did experience a characteristic that I didn't like. For control, I selected a Futaba* PCM system and the Astro 205 speed control. With all switches "on," everything worked as expected. But if the transmitter was turned "off" when the switches on the plane were still "on" (throttles retarded), the motors immediately jumped to full throttle—a very dangerous condition! A change to FM eliminated the problem.

TEMPTATION PREVAILS

When I had finished half of the camouflage paint job, the temptation to test-fly the new bird got the best of me! Test pilot Ray Doan and I met at the field and went through all the range-checking procedures. I explained to Ray all about "arming switch off," "throttle off," etc. (Ray had never flown "electric" before!) We were somewhat anxious about the high trees at the end of the runway, and whether the plane would get over them. And when all the preliminary checking had been com-

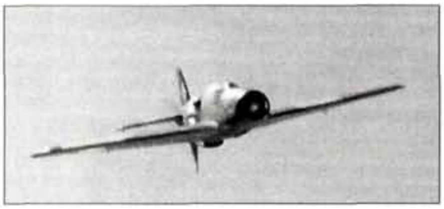




Left: the top half of the fuselage, the removable tail, and the two hatches can be constructed while still on the crutch. Right: minimal plywood (selected light balsa) with "open-bay construction," can go a long way toward building a fine flying "electric" scale model.

pleted, we had to wait 25 minutes for the 24-cell battery pack to charge! The new Astro 112 peak automatic charger was hooked up to the car battery and worked fine. All was "go!"

We used a small timer from Radio Shack (attached to the transmitter with Velcro®-brand fasteners) to time flights. Surprisingly, the plane climbed quite rapidly after rotation. There was a noticeable increase in the rate of climb after the gear had been retracted. Rolls were somewhat lazy compared to those done by our "over-powered" glow models, but penetration was acceptable. The pleasant, whirring sound of the two propellers replaced the usual snarl!



After 4 minutes, Ray entered the pattern, dropped the gear and greased the landing! There was even enough "juice" left to taxi back to the pit area—success! After 14 "R&D flights," we had learned enough to begin building the second electric Do-335. I added four more cells to the battery pack, found three lighter wheels and made the airframe lighter. When detailed as pictured and with the 28-cell pack, the model weighs 10 pounds, 2 ounces for a wing loading of 23.3 oz./sq. ft.

The new Master Airscrew 11x10 "electric series" prop was used up front, but at test time, a 11x10 pusher prop wasn't available, so a Zinger 11x8 pusher prop was used at the rear. The four additional cells used on this model (for a total of 28) provided greater full-throttle power, and they markedly increased performance. The additional cells provided the extra wattage for maximum thrust but also allowed the throttle to be cut back to about ½ throttle for extended lazy flights.

CONCLUSION

The same model powered by two geared Astro 25s and 32 cells, would weigh about 17 ounces more (including a change to 3/16-inch main-gear struts), and the wing loading would increase to 26 oz./sq. ft.—not too bad! The charger that handles up to 36 cells was a wise investment; my first venture into "electrics" was a most rewarding project!

**Addresses are listed alphabetically in the Index of Manufacturers on page 135.* ■

PRODUCT REVIEW

Explore digital modeling design

DesignCAD 2D 6.0 VERSION

by ROY L. CLOUGH JR.

FIRING up the all-new, 6.0 version of DesignCAD* 2D on my new 486 computer gave me an inkling of how old-time propeller pilots must have felt moving up to jets: things happen faster, controls don't feel the same, and the readouts that guide your flight are displayed differently. It took me a week or so of popping back and forth between the new 486 and my old faithful 8086 (still loaded with DesignCAD 5.0) to sort out which differences were attributable to new hardware and which to new software.

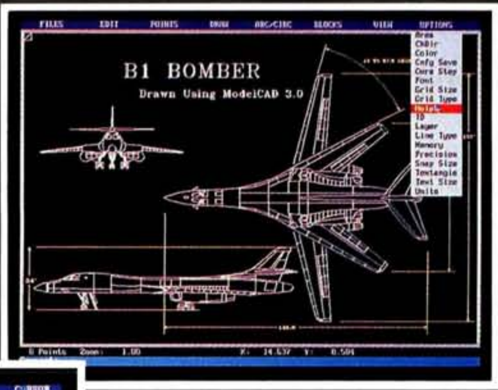
RELUCTANT AT FIRST

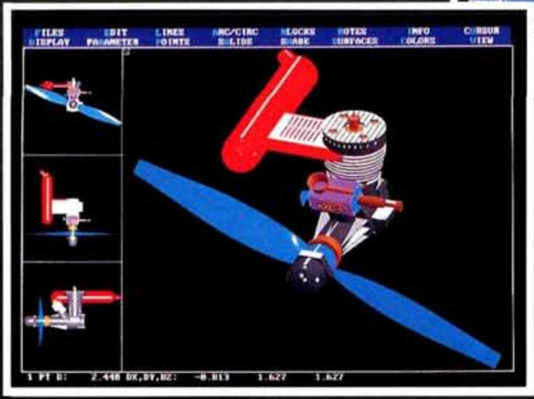
Even allowing for a big gap in hardware technology, DesignCAD 6.0 *does* run faster. Its new DW2 format saves files quicker and uses less disk space. Retrieve old DC2 files by adding a DC2 extension; they can be re-saved as either DC2 or DW2. A whole bunch of new commands have been thrown in including Bezier curves and a DOS shell. Despite these goodies, I felt no immediate urge to jump on the DesignCAD 6.0 bandwagon. Frankly, my first reaction was that vague hostility some of us old bucks tend to feel toward innovations that threaten to restructure routines with which we are comfortable. Reinforcing this built-in headwind was a glitch (minor but annoying) in the initial set of disks.

The replacement disks that were sent to correct the problem wouldn't load, so there was a further delay while I waited for a *third* set of disks. When they finally arrived, I just sat there looking at them for a few minutes and talked myself into an unbiased frame of mind before trying them.

It was reassuring that the program language had been changed. No software company in its right mind wants to rewrite a complex, highly successful program to another source code without compelling reasons. ASBC must have foreseen immediate improvements and future advantages.

Advance billing promised many new commands; these were delivered. Operational commands were supposed to have been cleaned up—agreed. Another welcome change was the absence of 5.0's annoying trick of making one wait out a rain of drop-downs before getting a simple operation from the command line.





Above and left: examples of ModelCAD and DesignCAD 3D DOS and screen displays.

In the new stuff was one of my favorites—Bezier curves—the basic bones of model plane design. The new command for these works well, but it needs more detailed instructions so that people who are unfamiliar with Beziers can manipulate the curve. Another new option is a DOS shell—for my money, a long overdue feature. If you need to format a disk for an extra copy of what you're working on, you can pop right out of DesignCAD, and then type 'EXIT' <RETURN> to put you right back at your drawing.

If, like me, you frequently include related text files on your drawing disk, you've noticed that Design-CAD's directory/retrieve command doesn't normally list files in foreign formats. To list *every* file on a disk, bring up the

DesignCAD 3D Windows.

PHOTOS COURTESY OF AMERICAN SMALL BUSINESS COMPUTERS INC.

retrieve box with F9. TAB to Filename and type "*.* <RETURN>". (To retrieve from symbol libraries shipped with earlier versions, you must type in the extension DC2.)

NO BLOCK COMMANDS

Sounds great, right? So, what was my big beef with 6.0 that made me feel I might have been better off if I had stuck with 5.0?—*no Block Commands*. I had lived and breathed Block Commands and, suddenly, they were gone. Model-plane drafting involves lots of repetitive and mirror-image stuff. Wing ribs are duplicated and/or re-sized for tapered wing panels. There are right- and left-hand tail-plane halves, top and bottom fuselage lay-outs and expanded views of vital details. Finally, these elements have to be juggled to fit within the confines of a finished drawing—all block stuff! But Block Commands were gonzo, zip, nil, vanished. In their place was an expanded list of Section Commands that appeared to do about the same things as Block Commands, and the highlighting was better. That was some comfort.

Still, I thought that most operations were more cumbersome. It seemed I had to differentiate very carefully between elements, sections and groups. Duplications in a circle (like radial engine cylinders) had to be studied a bit to make them land exactly where I wanted them. I finally nailed it down. For me, the new Section Commands were not as *intuitive* as my familiar block manipulations.

Working my way deeper into 6.0's Section Commands, I kept recalling the old saying that ignorance is bliss. This is why I'm rehashing *my* problems here, to make the point that old hands at DesignCAD 2D may have more trouble adjusting to the rewritten 6.0 than newcomers. You should realize, as I finally did, that intuition is a hunch based on past experience. A couple of months into 6.0, I had no doubt that if I had tested Section and Block Commands without prior knowledge of either, I'd have thought Section Commands clearly superior—but not perfect. With 5.0, when you defined a block, it *stayed defined*. Two or three keystrokes would copy it, rotate it, scale it, move it, mirror it, copy it in a circle, save it and retrieve it. Your block stayed with you until you were finished and until you "undefined" it.

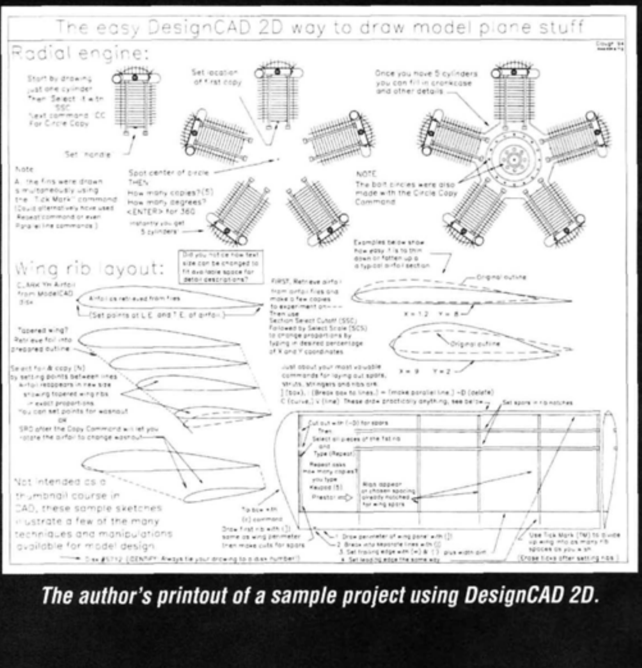
The 6.0 Section Commands work differently. You don't "define," you "select" for one particular operation, after which the "selection" disappears. To continue manipulating, you have to "reselect last" by hitting F4. (I'm told by Keith Campbell, V.P. of Marketing for ASBC, that the new Windows version of DesignCAD 2D *will* hold "select" until it is canceled. The DOS version will have to wait for the next upgrade.)

With any software upgrade, re-learning favorite moves can be inconvenient. The Point Relative command with which I zipped the cursor all over the screen now requires that a point be set before it takes off—not an improvement in my book. It trails an incipient line that must be escaped before going to work in the new location.

Some minor glitches no longer happen. The old Parallel Line command (=) could throw a copy of a curve off-screen. You wouldn't know it was there until you tried to print, or hit Zoom Zero and saw your drawing shrink dramatically to include a little spurious arc off to one side. ASBC says no changes have been made to this command, but I haven't had this problem with the new version.

One infrequent bug remains. If you try to parallel a duplicate line *inside* an existing curve, you may get a wobbly squiggle instead. ASBC assures me that this is mathematically correct; a moot point because you obviously can't use such a line. I've found that it never happens if you draw the inside curve *first*, then make the parallel copy *outside*. This glitch, however, brings up one of the most endearing features of DesignCAD: if you can't get what you want with one command, try another. Something will work. Sporadically, I have problems trying to extend lines with the EX command—no sweat. When EX doesn't work, I use Point Move, which always functions; just be darned sure to set your point on the correct line. Trim commands can also be troublesome when you have a lot of lines in a small area. The problem isn't software, it's screen resolution. ZOOM to be sure you get *exactly* the one you want: DesignCAD 2D responds to what you do, not to what you hoped for.

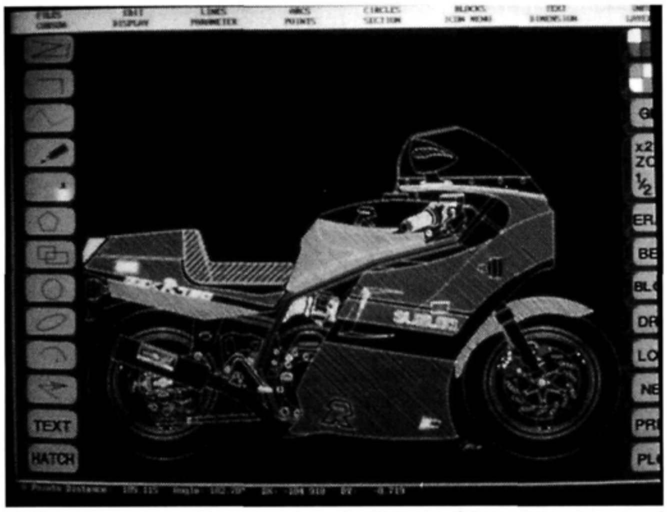
Not immediately obvious to newcomers is that commands, for the most part, will cascade. You can pick up a lot of speed and accuracy by piling one atop another. For example, the parallelogram command (]) asks you to set a point for the first corner, then the program highlights your cursor movement to show you where to set the second point to draw the figure. A much more accurate figure results from keystroke (],) set first point, followed by keystroke (') which pops up a panel asking for X and Y coordinates. Type these in and <Enter> draws the figure with vastly greater precision than you could do by hand. The same goes for circles: set the center point from the (o) command, key in ('), then type either an X or Y coordinate for the radius and presto!



The author's printout of a sample project using DesignCAD 2D.

DESIGNCAD 2D

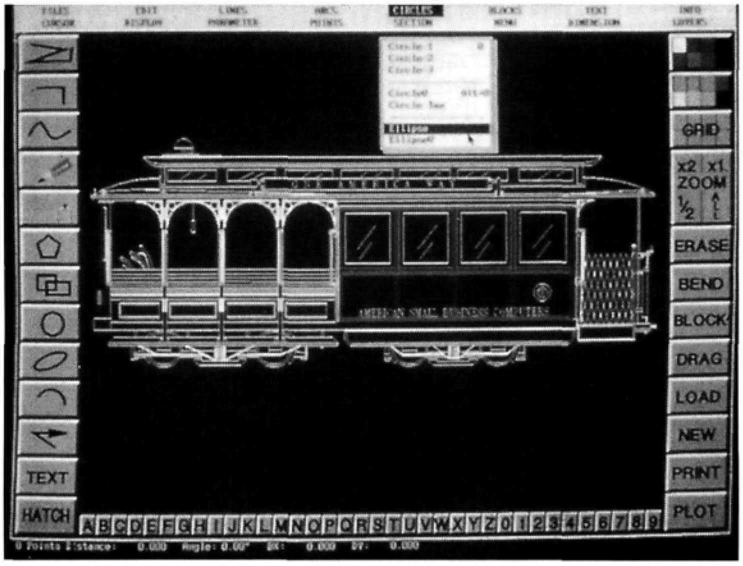
The ^D command is a section delete that "erases" whatever you enclose in its rubber-band box, but don't think of it as an eraser; it's one of the most valuable *drawing* tools in your arsenal. For example: much of model plane drafting calls for spars, stringers, struts and ribs that intersect all over the layout. Drawing them without overlaid cross-hatches at each intersection can mean laborious point-setting of lines between lines, or carefully positioned section copies all over the place. A faster way is to draw your ribs and spars smack on top of one another, then erase the cross-hatches that develop with (^D,). Set a point just inside the area you want to clear, punch up XY coordinates, and feed in the numbers.



This page: other applications of DesignCAD 2D. (These happen to be of Version 5.)

When it comes to drawing ribs and spars, it may be tempting to set a Line Width command (without fill) to get a double line to indicate their widths. Don't do it. Wide lines (with or without solid fill) have never been a DesignCAD 2D strong point. They are generated on each side of a selected center point and, though they appear (non-filled) to be two parallel lines, they cannot be manipulated as such. Whatever you do to one is done to the other. For example, you can't draw a heavy spar with a wide line and then notch one side. Don't even try. Here are two better ways:

- Use the (=) Parallel Line command. Draw your first edge, then precisely lay down a parallel (=) to it using an XY (') coordinate. Use select and copy commands to repeat the figure (as needed) across the whole layout.
- The second way is to use the parallelogram command overlaid with XY (') coordinates to draw both spar sides and both ends all at once. Then hit (:), and set a point <Enter> to break up the single element box into four lines you can deal with separately.



At either a drawing board or a monitor screen, you can invest a lot of time in a drawing. On a drawing board, your latest work is always right there (complete with smudges), but a CAD display is vulnerable until you save it. Don't rely on automatic file backup to keep up with last-minute changes. Start each session by retrieving your previous drawing and immediately re-saving it under a new name. Then as you work, save the new name at frequent intervals (in case of a power failure). Leave your original drawing file unchanged until the end of the session. If you are then happy with the new drawing, save it under the original name and delete "newname" to conserve disk space. Remember, too, that even the best quality floppies can have a glitch. Crucial information should be saved on a second backup disk. It is a small comfort that my supplier cheerfully replaced the bad disk that refused me access to two days' work.)

Bite the bullet, learn the new commands, and start saving hours and hours for the other good things in life.

FINAL THOUGHTS

At first, I wasn't too happy with 6.0. It took me a few weeks to become really comfortable with new ways of doing old tasks. I am now familiar with Section Commands, and I'm convinced that their performance is superior; they're much more difficult to foul up. For example: dragging a selected entity no longer results in those terrible size-changing things that could happen with imprecise attempts to drag blocks. If you're already into DesignCAD 2D, be well-advised and upgrade to 6.0. Even if its only advantage is speed, whatever value you put on your time will soon make up for the price. Bite the bullet, learn the new commands, and start saving hours and hours for the other good things in life.

In "CAD for Your Model Planes" (*Model Airplane News*, June 1992), I wrote that ModelCAD (the kid sister of DesignCAD 2D) was a great place to start because its CAD teachings would easily transfer to DesignCAD 2D. Although you'll have to re-learn some things, ModelCAD does provide basic CAD exposure, an array of airfoils and a cash refund when you upgrade your software. But if the possibility of getting deeply involved with CAD occupies any sizable percentage of your daydreams, you'd be better off skipping ModelCAD entirely. Shell out the cash for DesignCAD 6.0. You can still get the ModelCAD airfoils. (Mention this article with your order, and ASBC says you needn't return the airfoils disk you already have.)

My opinion and my advice remain the same as in my previous article: whether you decide to test the water with ModelCAD or to dig deeper in your jeans for DesignCAD 2D 6.0; whether you design your own or bash existing designs, you need CAD.

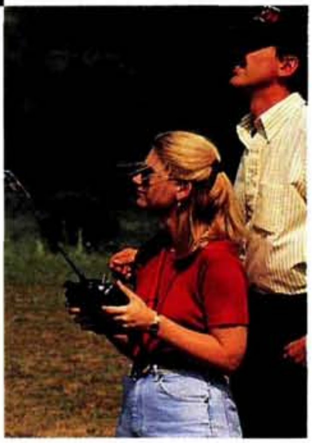
**Addresses are listed alphabetically in the Index of Manufacturers on page 135.*

■

FIELD & BENCH REVIEW

Beginner-friendly Sunday flier

by DEBRA SHARP



AS ASSISTANT editor of *Model Airplane News*, I deal with authors, manufacturers, other departments and deadlines—just about everything *except* R/C planes. While working here, I've learned a lot about building and flying models, but until now, I hadn't had any "hands-on" experience. When the Hobby Shack* Flying Start—a model publicized as "the most beginner-friendly trainer ever"—came in to our office, I knew that it was about time that I saw what all the fun was about.

SPECIFICATIONS

Model name: Flying Start
Type: polyhedral high-wing trainer/sport flier
Manufacturer: Hobby Shack
List price: $124.99
Wingspan: 52 in.
Wing area: 410 sq. in.
Weight: 48 oz.
Airfoil type: flat-bottom
Length: 33 in.
Engine used: Magnum XL .15 pull-start (included)
Prop used: 8x5 Sanye (included)
Radio req'd: 3-channel
Radio used: Hitec Flash 5

Features: sturdy aluminum frame, built-up and covered wings, hardware package with landing gear and all necessary screws and bolts; good instructions; decals.

Hits
- Easy to build.
- Orange underside of wing makes it highly visible.
- Included Magnum XL .15 pull-start engine is reliable and simple to set up.

Misses
- Forward section of the plastic fuselage is somewhat flimsy.

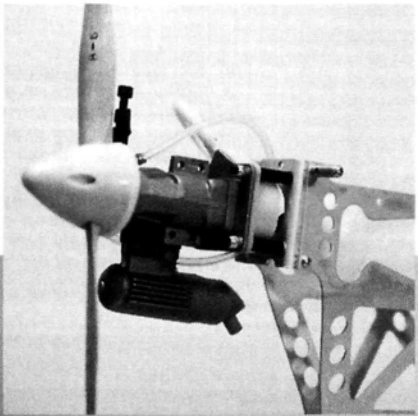
HOBBY SHACK
Flying Start

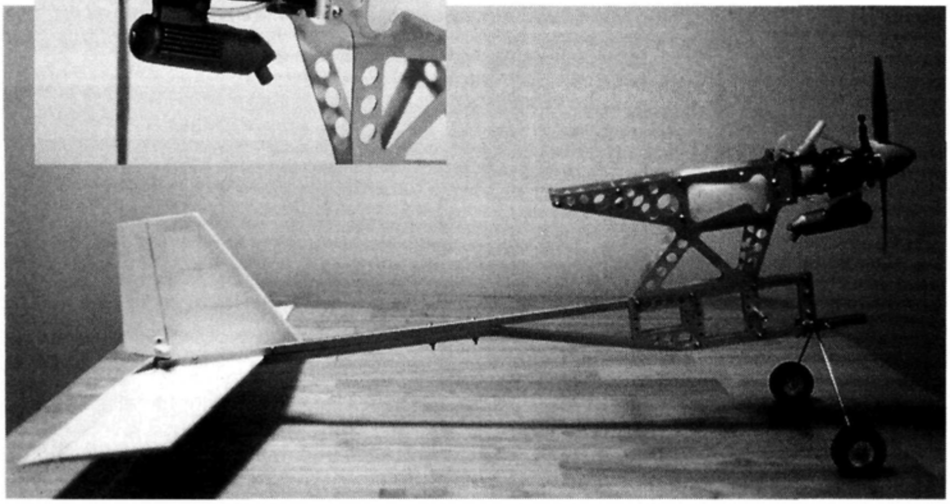
ASSEMBLY

Building the Flying Start couldn't be easier; just get out a Phillips-head screwdriver and a 3mm nut driver and go to work! The sturdy frame is made of two square, hollow tubes, and the wing trestle halves are light aluminum with lightening holes.

The design is ideal for novice modelers because there are very few main pieces, and hey fit together perfectly. The step-by-step, photo-illustrated instructions and full-size CAD drawings of the various fasteners used n each step certainly helped me out. All hardware, including landing gear, is included, and the Flying Start also comes with a Magnum XL .15 ball-bearing, pull-start engine. A list of the other tools and supplies you'll need to build and fly the model is in he instructions.

The wing panels come built up and covered, but not joined. The wing has an attractive fluorescent-yellow leading edge, green and red stripes and an orange underside; you'll never lose sight of this model! The wing panels are joined with two dowels, and hey are easy to align. I used Great Planes* 30-minute epoxy to assemble them and to fill in any small gaps between the panels.





Left: the engine is supported by four stand-off spacers (to make room for the pull-start). You need only bolt it into place. Below: the basic fuselage structure is made of aluminum; although it's light, it protects the servos and the receiver from damage in hard landings.

HELPFUL HINTS

Although the instructions and photos were generally clear and easy to follow, I had to turn to the experts in the office for help a few times.

• **Prop and spinner assembly.** To properly align the included 8x5 propeller and the spinner cutouts, I had to cut off two plastic alignment tabs on the backplate.

• **Mounting the off/on switch.** The manual simply instructs you to remove the faceplate from the radio on/off switch and use it as a template to make a cutout on the bottom of the fuselage. Just as I was about to cut a rather large rectangle in the middle of the fuselage (on the seam), one of my modeling mentors stopped me and explained the correct way to mount a switch. My first mistake was in tracing the entire switch plate. You should trace only the *inside* rectangle (where the actual switch sticks through). My second mistake was in placing the switch on the seam; this could cause it to split in two. Instead, place it off to the side a little. I also learned that using a drill to make radiused corners before going to work with the X-Acto knife can minimize the chance that you'll crack the plastic.

• **Throttle pushrod.** To prevent the wire from being chafed against the aluminum airframe, all the pushrods are in nylon sheaths. The sheath on the throttle pushrod, in particular, can slide; this could possibly jam the servo and also allow the pushrod to contact the metal frame. To prevent this, I suggest that you CA the nylon sheath to the zip-tie that holds the throttle pushrod to the wing trestle.

• **Landing gear.** If you're a beginner, you might have a tendency to nose the model over on landing. To help prevent this, bend the landing gear forward about 10 degrees, and check it frequently to ensure that it doesn't bend backward at all.

• **Servo installation.** The Hitec* Flash 5 programmable radio I used came with four HS-422 servos, which were a little too big to fit in the openings in the fuselage. We used

FLIGHT PERFORMANCE

We test-flew the Flying Start on a moderately breezy summer afternoon. The Magnum XL .15 started easily on the second pull, and even without a break-in, it ran perfectly. Model Airplane News columnist Dave Baron, my flight instructor for the day, helped me put the Flying Start through its paces.

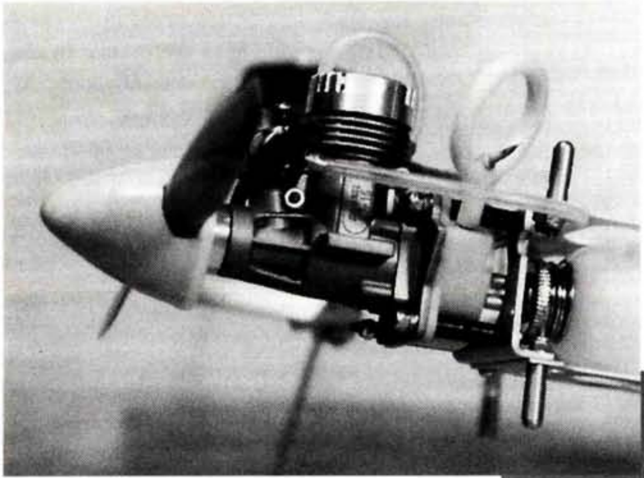
• Takeoff and landing
We hand-launched the Flying Start into the wind. It pitched up and effortlessly started an ascent to about a few hundred feet. When landing, it's best to take it nice and slow. Reduce the engine to idle and glide the model in.

• High-speed performance
With the engine at full throttle, the model flies at approximately 20 to 30mph and is very stable. Full throttle will help the model to penetrate wind and to perform aerobatics.

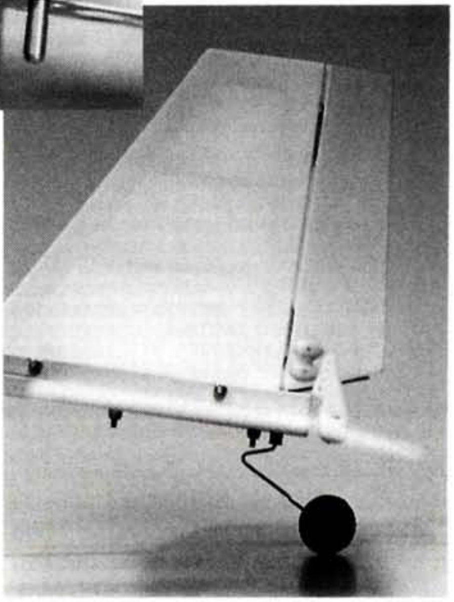
• Low-speed performance
At low speeds, the Flying Start is so stable that it almost flies itself. With a little up-trim, it easily maintains altitude, and small corrections are all that are needed to control it.

• Aerobatics
It's safe to say that the Flying Start is capable of any aerobatic maneuvers a novice might care to undertake (as long as a flight instructor is nearby!). Small loops and barrel rolls are a piece of cake; just remember to use sufficient down-elevator in a roll to prevent the model from losing altitude while inverted.

a file to slightly enlarge the openings, but the servo wires still wouldn't fit through. The instructions suggest that you carefully take the servo cases apart, but the other editors weren't comfortable with the thought of a modeling novice taking apart servos, so we filed small, half-circle notches in the openings instead.



Left: the included Magnum XL .15 engine has a unique pull-start, which means that you only need a glow plug and driver to start it; this mean that there's less equipment to buy and less to carry to the flying field. Below: for ease of construction, you simply bolt the tail parts to the fuselage. The tail wheel and landing gear come with the kit.



NEW AND IMPROVED

Each wire pushrod has a Z-bend at either end and can be extended or shortened by loosening two setscrews in an aluminum coupler. In future kits, the pushrods will have a metal clevis coupler at the control-horn end to facilitate throw changes.

The 4.8V, 650mAh battery pack is mounted with rubber bands on the lower fuselage frame forward of the wing trestle halves. This arrangement worked well; however, future kits will include a battery-mounting plate to make this assembly sturdier. This should also add a little needed weight to the model's nose (my model was slightly tail-heavy).

Because Hobby Shack understands that beginners are likely to crash the Flying Start at some point, future kits will include an extra plastic nose cone (the most vulnerable part of the model).

AT THE FIELD

To test-fly the model, some of the *Model Airplane News* staff took a field trip to the FLYRC field in Southbury, CT. We added some weight to the Flying Start's nose and filled the tank with Cool Power* 15-percent-nitro fuel.

After a quick check of the controls and the throttle response, we fired up the Magnum .15 engine with two easy pulls of the starter cord. With columnist Dave Baron at the controls, associate editor Roger Post hand-launched the model into the sky. I watched proudly as *my* model gracefully flew overhead, easily looping and rolling and performing low, slow flybys. Then it was my turn.

Now I can understand my fellow editors' enthusiasm for R/C airplanes; I had enjoyed building this model, and flying it was definitely exciting. The Hitec Flash 5 radio was light and easy to hold, and the Flying Start obeyed every command without fail. On its last flight, however, I prematurely "landed" the Flying Start off field. On recovering it, we realized that the plastic nose had split and cracked open and the aluminum frame was slightly bent to one side.

Everything else—except my pride—was OK; this is one sturdy model! We easily bent the frame back into place, dusted off the wing and declared the Flying Start as good as new. As with any Hobby Shack kit, you can call and order specific parts, so I'm anxiously awaiting the arrival of the replacement nose cone. I can't wait to go out to the FLYRC field again next weekend; I just might be hooked on R/C.

**Addresses are listed alphabetically in the Index of Manufacturers on page 135.* ■

Ben Shereshaw's '36 Custom Cavalier gas model airplane.

A lifetime of designing model planes and miniature engines

THE Ben Shereshaw STORY

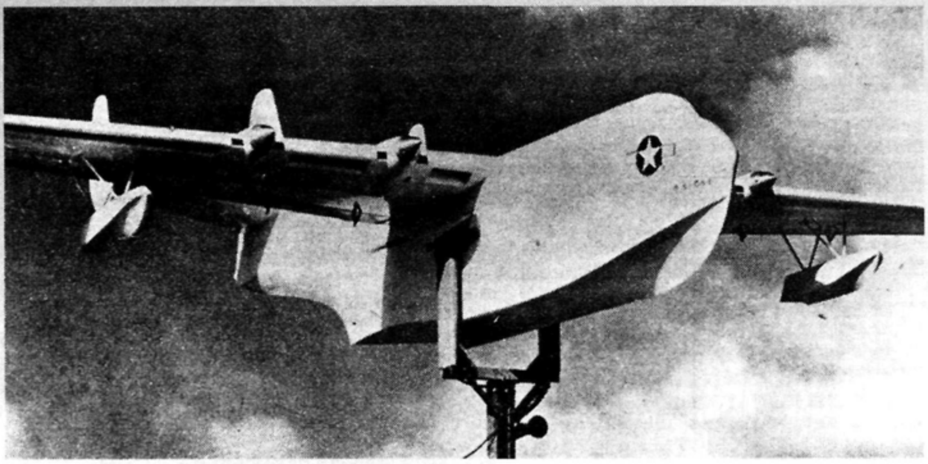
by FRANK GUDAITIS

THIS OCTOGENARIAN is remembered fondly by many old-time model builders. If anyone can accurately be called the grand old man of model aviation, it's Ben Shereshaw.

His many contributions to the development of miniature airplanes are almost legendary, and they span more than six decades. Fortunately, there are other distinguished pioneering old-timers still with us. However, Ben's history is unique in that he has excelled in both model airplane design and in miniature engine development and production.

Model aviation pioneer Ben Shereshaw with his latest Bantam engine at the 1993 Westchester Radio Aero Modellers Show.

His list of firsts is impressive. It begins with the very first gas model kit—the Loutrel Speedster of 1935. Two years earlier, he had also been involved in experiments with R/C. His original powered model airplane designs are still in use today. In June 1937, *Model Airplane News* published Ben's drawings and construction details of the Nimbus—a well-engineered, early gas model. Around the same time, he also designed the 9-foot-wingspan Custom Cavalier, which became one of the greatest contest win-



The Convair XP5Y-1 flying-boat test model had a 12-foot wingspan. The four twin-cylinder engines were designed by Ben Shereshaw circa 1948.

ners of all time. It was sold in kit form by Berkeley Models and is still being built and flown today with R/C-assist by members of the Society of Antique Modelers.

THE BANTAM 19

Responding to many requests for smaller gas models, Ben designed and built several small Class A engines. The result of this work was an engine with a .19ci displacement. The Bantam 19 was the first small engine in production with a rotary intake disk valve. It was clean and elegant, and not a single line was out of place; it was also a consistently outstanding performer. Three Nationals and countless first-place wins were won by models powered with the Bantam engine. So great was its fame that more than 80,000 were manufactured and sold worldwide.

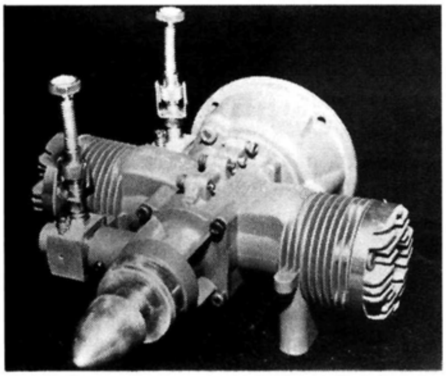
In 1938, Ben designed a twin engine (in tandem) R/C model for Clinton DeSoto—one of the early R/C pioneers and a staff member of the American Radio Relay League (the AMA of ham radio). Because of malfunctioning electronics, this model was flown at the '38 Nationals with disastrous results. Four years later, DeSoto started a company called "Radio Control Headquarters" in New York City, and he asked Ben to design a twin-boom pusher. This became another first—an R/C plane in kit form.

Before World War II, Ben was developing small engines and actively promoting competition flying with gas models. He was the contest director for all the Eastern States Gas Model Meets. *Model Airplane News* cosponsored these early contests.

Ben was also a radio commentator on John Gambling's "Model Airplane Club of the Air." In addition to teaching at a Newark, NJ, high school, Ben found time to design many commercial airplane models, including the Commodore, the Mercury and the Baby Eaglet—one of the first small Class A gas model kits for the Scientific Model Company.

MILITARY PROJECTS

After Pearl Harbor, Ben's shop produced precision components for the military. One of his more interesting projects was for the U.S. Navy Bureau of Special Devices. He designed a small, two-cylinder, air-cooled engine for a small, tethered, coaxial helicopter that raised a beacon antenna high above the ocean by fliers who were forced down over the Pacific.



Shereshaw's Bantam 60 twin engine of the 1950s.

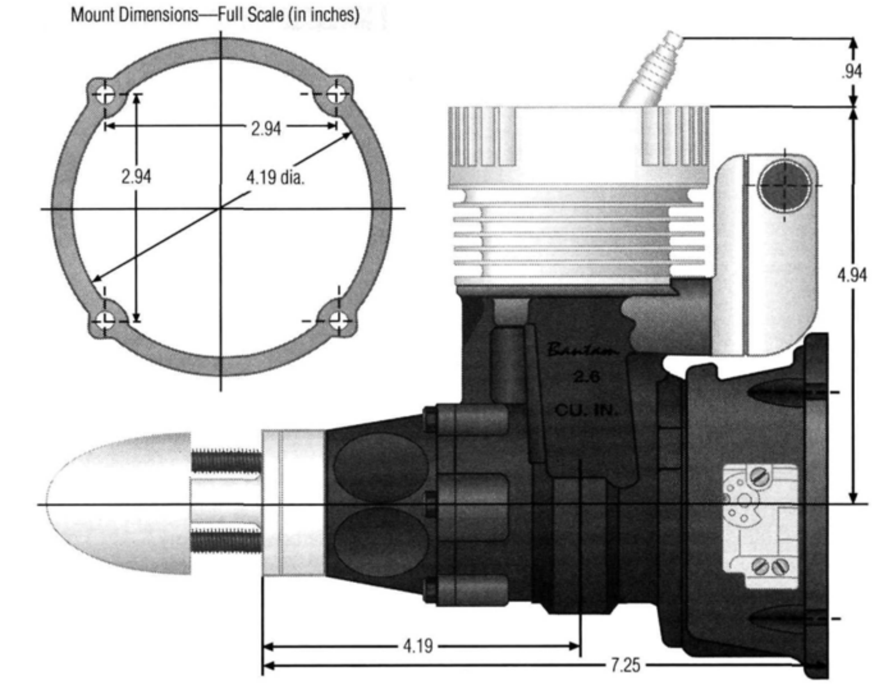
Four of Ben's twin-cylinder 3.25ci engines powered the Convair XP5Y-1 flying-boat test model. Flight tests of this 12-foot-wingspan R/C miniature aircraft were so successful that the Navy subsequently awarded Convair a contract to build the full-size version.

After the war, Ben resumed the manufacture of his very successful Class A Bantam engine. Around this time, two men named Smith and Chamberlin brewed a very potent fuel called "Liquid Dynamite" for miniature, 2-stroke engines. Ed Chamberlin and Ben discovered that the Bantam engine would continue to run on this fuel with the spark-plug wire disconnected. From this experiment, they learned that a spark plug could be converted into a glow plug by removing the points and welding a very small coil of nichrome wire in their place. It was one of the earliest glow plugs. The late Roy Arden perfected this by substituting a coil made of platinum iridium wire. Ben's company manufactures millions of XL glow plugs.

Ben also designed the Bantam .60 twin with some unique features. This engine had two carburetors with balanced fuel flow, good idle characteristics, dual rotary valves, four ball bearings on the crankshaft, Teflon seals and no gears.

In 1962, Ben worked with the engineering department of the Republic Aviation Co. in Farmingdale, NY. Under a contract from the Office of Naval Research, their task was to develop a compact, light

The U.S. Marine Corps drone reconnaissance platoon circa 1966. Ben's engine is in the remote-control aircraft that's on the launching catapult.

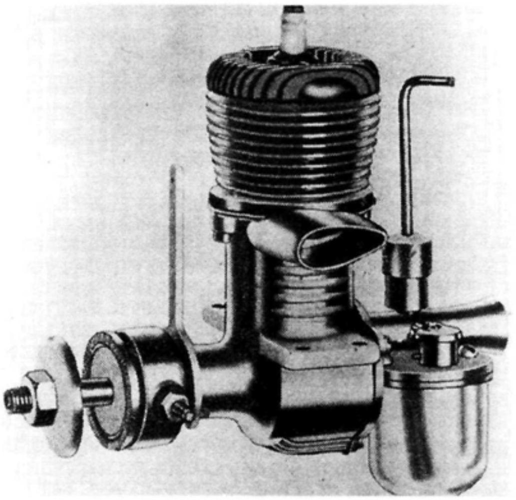


Ben Shereshaw's latest engine design—the 2.6ci Bantam—is for large-scale R/C models.

weight, photo reconnaissance drone for the U.S. Marine Corps. Because of the bare essentials of the design, it was named "Bikini." Ben was asked to supply a small, lightweight, 2-stroke, air-cooled, two-cylinder engine for this aircraft. The result was the Bantam 3.25, which was similar to the earlier version supplied to Convair. It weighed 3½ pounds and turned a 20x20/18 prop developing 4½hp at 6,000rpm. Wind-tunnel tests were conducted at a University of Maryland facility. Subsequent flight tests were successful, and the Bantam 3.25 won a fly-off against the Chance Vought Company. Several squadrons of Bikini drones were supplied to the Marine Corps, and the Bikini became the grandfather of reconnaissance drones.

A BIGGER BANTAM

Ben's latest Bantam engine is the 2.60ci powerplant for ¼-scale airplane models. Unlike currently available, converted weed-whacker and other similar gas engines, this Bantam was designed specifically for powering model planes. Careful attention was paid to low reciprocating masses, which resulted in relatively low vibration levels. A light, simple, solid-state, battery-ignition system was effective at low cranking speeds. Turning a 22x6-inch Zinger* prop at 8,000rpm, it will produce the equivalent of up to 30 pounds of static thrust. Typical of Ben's high standards, this engine has a long life as a result of his uncompromising choice of materials, bearing selection and excellent workmanship.



Shereshaw's masterpiece—the 1939 Bantam Class A engine—won three consecutive Nationals and countless other competitions.

For all his many achievements, Ben Shereshaw remains a soft-spoken man. It has taken this writer two years of gentle prodding to get him to agree to this brief profile of his career. His dedication to and respect for model building and model builders has been and still is the theme that governs his life.

**Addresses are listed alphabetically in the Index of Manufacturers on page 135.* ■

GOLDEN AGE OF R/C

HAL deBOLT

NEWS FROM NEW YORK TO TEXAS

THIS IS *YOUR* OT R/C place, so after several months of R/C history, it seems like a good time to catch up with what's going on with you.

R.J. Talley of Nederland, TX, wrote in about his early R/C and control-line (CL) efforts and his current OT'er activities. You may remember Bob as the originator of the "Flying Stop Sign," which led to the astounding contraptions that air-show people impressed us with.

Bob began CL in New Orleans with assorted Dmeco bipes. With his original, he accomplished maneuvers that resembled inverted flight—something I never managed! He flew our "new" bipe powered by an O&R .23 almost daily, dawn to dusk.

Early Nashville R/C'ers—Carl Gilles and his friends prepare for flight. Note the huge elevators!

While stationed in Japan with the Air Force, Bob was introduced to R/C by a Liberty Belle; but he wasn't in Japan long. Back in the USA, the Live Wire (LW) Trainer was then the thing to fly, and he powered his with an OK Cub .14 and used a Citizenship radio. Bob says he made his first flight one day after all the other R/C'ers had become frustrated and quit. He says the memory of that Trainer climbing out, responding to control and finally landing at his feet is burned into his memory! Does that sound familiar to anyone?

After a lifetime of R/C, Bob is back into OT'ers with several replicas. He says that his O.S. .26 Surpass-powered Champ is a dream to fly; it can perform maneuvers that the original never even heard of! He was surprised when he found that no one at his field had the slightest idea of how to hand-launch his replica Trainer. Finally, a glider type managed it! So much of what we knew in the old days has been lost.

The grapevine continues to tell of successful 27MHz-band flights. George Wilson of Marstons Mills, MA, and his Cape Cod flying group have encountered no problems with extended use. He suggests that current CB'ers use sophisticated synthesized equipment that's difficult to modify. That seems to be a good omen for those who wish to use early R/C systems. Does anyone other than Cox produce R/C on 27MHz these days?

George also tells us that *Model Airplane News* expects to publish his updated version of the LW Trainer. We hope to see it shortly!

R/C FAMILY

Reuben Schneider of Phoenix, AZ, writes to say that he had a nice conversation with my stepdaughter on top of an Arizona mountain—what a small world! He has been wondering why we haven't discussed the LW Acrobat; one of them served him well for more than seven years. The answer is simple: this bipe is part of the first "Quick Buld" series that Dmeco offered. The advent of Quick Buld kits will be part of my R/C plane evolution series in the near future.

Our OT R/C fraternity is just great! Floyd Gambler of Patchogue, NY, sent a short note to say that he has a pristine LW Cruiser kit; he asked whether I have any use for it. I'll be assembling it soon, and a friend will use it to learn R/C. It should make an interesting report on how an OT R/C model can fit into today's picture. Many, many thanks to Floyd!

FATHER KNOWS BEST

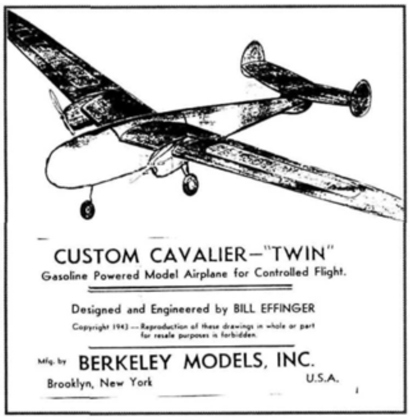
Another letter came from David Irwin in Canada. His father had success in the '50s with the LW Super Cub, and he suggested to Dave that it would make a fine scratch-building project with the performance he's looking for. Dave's question is common: the 1957 plans call for a .15 engine; what should he use today, especially if he wants it to take off instead of being hand-launched as was done back then?

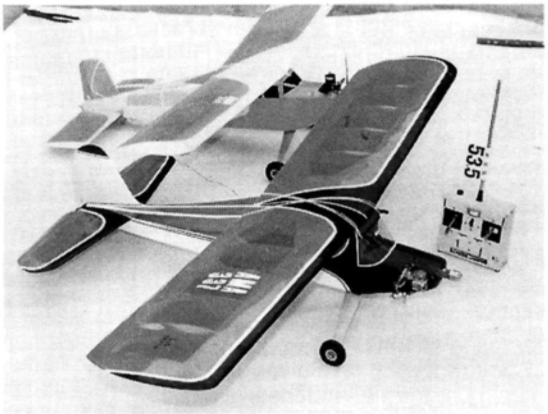
Well, circumstances in the early days were very different. Slow-flight capabilities were vital for both the novice pilots and the rudimentary control action of that time. To overpower would have been asking for trouble!

Hal deBolt with the original Acrobat. That Nashville knoll top seemed much smaller than the photo shows it to be.

Low power would fly models of all types, but it was seldom sufficient for takeoffs from rough fields. Today, we have excellent control systems that even newcomers can operate. Also, power control is no problem, and we have far superior flying sites. So, considering that today's engines are so much more powerful, the specified engine should duplicate original flight easily. It should be OK to use a larger size, though, to ensure more positive takeoffs. Remember, you don't have to use full power in flight if it will create a problem. The Cruiser, for example, can be powered with an O.S. .40 4ci even though the plan calls for a .19. We expect it to fly at about $\frac{1}{2}$ throttle. We do have more leeway today!

Morris Frappier of Ney, OH, provides us with info about an unusual kit—the Custom Cavalier. Morris has a kit for a twin-engine version, which he hopes to have time for one day. The





Above left: Berkeley found a mother lode with Shereshaw's Cavalier; with cosmetic changes, they made it into the Super Cavalier plus a smaller Cavalier 60. The coup de grâce would be the twin version. Right: Bob Talley's remake of his OT LW Trainer and Champ. I bet the originals didn't sport such gorgeous finishes!

LOU ANDREWS, AMA 16

Once more, my generation's ranks have been thinned by the loss of another fine modeling pioneer. Lou Andrews was a gentleman and a dear friend to many of us.

Lou Andrew's AAMCO Aeromaster went through a series of updates. The latest shows an even stronger Stearman appearance.

As an accomplished modeler, Lou entered the hobby industry as chief designer for the Guillow concern. In the postwar era, with Lou at the helm, Guillow offered a fine series of CL kits. The Trixter was outstanding as the first CL kit dedicated to inverted flight. (The popular Barnstormer was another great model.) The Trixter was a simple design that flew equally well right-side up and inverted. I got my needed inverted-flight practice with a friend's fine flying Trixter. It sure set the trend for the future of CL!

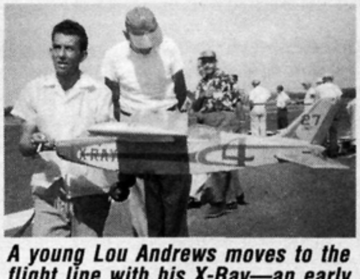
Henry Wisler displays his version of the Lou Andrews-designed Guillow Trixter Beam—a popular early R/C kit.

When Dmeco offered the first LW R/C kit, Guillow and Andrews quickly followed with the Trixter Beam. Nicknamed "the Guppy," it served R/C well. The Beam was followed by a series based on the Smog Hog style.

Lou Andrews left Guillow to establish his own Andrews Aircraft Model Co. (AAMCO). His "Ray" brand was a series of cabin-to-shoulder-wing-style trainer-type kits such as the H-Ray, the S-Ray, etc. With the arrival of low wings, a Master Series came into being—the Trainermaster, the Sportmaster, etc. Typical of Lou, they were high-quality, sound performers. Probably most notable of all was the AAMCO Aeromaster biplane.

AAMCO was seriously set back by a devastating fire in the '70s; it took a lot of wind out of their sails. The heritage, however, lives on with Great Planes' continuing production of the Aeromaster these 30 years later!

Our memories of this fine man and friend who devoted his life to modeling will certainly live on. Surely, Lou Andrews has joined our heavenly R/C fraternity and will be sorely missed by us all!



A young Lou Andrews moves to the flight line with his X-Ray—an early AMA pylon racer. The 27MHz decal on the film wasn't required.

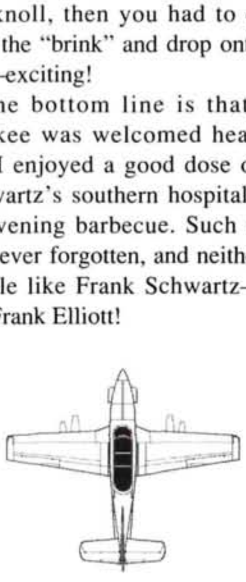
plans call for two Ohlson 60s; I wonder how many OT R/C's could handle all that power (no reliable throttles in those early days). The original Cavalier used one Brown Jr.!

SOUTHERN HOSPITALITY

Frank Elliott of Santa Fe, NM, wrote to remind us of another unsung hero whom we mentioned a short time back—Frank Schwartz of Nashville, TN. He was one of those who made it simpler for many of us. Elliott tells of informative R/C sessions that took place at the Schwartz home; they lasted into the wee hours; boy, were we hungry for info in those days! Frank S. also took care of their radio problems at no cost. How we went out of our way to help one another! Frank's early love was a Smog Hog followed by an Astro. He "stuffed" a reed system into a little .19-powered Wildfire biplane—truly a wild one!

I have many memories of Frank S. from the early days. While on a "busman's vacation," I managed to take in a Nashville meet. The site was a public park where they "shaved off" the top of a knoll for a takeoff circle. Landings were an experience; you flew up the side of the knoll, then you had to come over the "brink" and drop onto the top—exciting!

The bottom line is that this Yankee was welcomed heartily, and I enjoyed a good dose of the Schwartz's southern hospitality at an evening barbecue. Such times are never forgotten, and neither are people like Frank Schwartz—just ask Frank Elliott! ■



FIELD & BENCH REVIEW

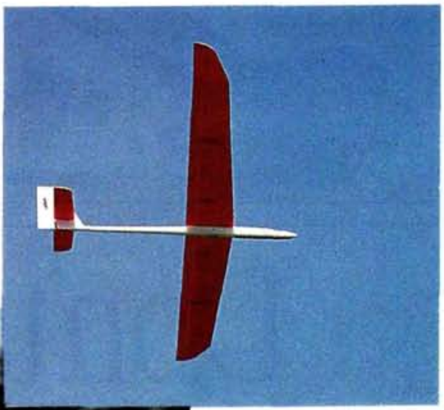
AIRTRONICS Thermal Eagle

by SAL IASILLI

A refined version of a proven performer

AIRTRONICS*' THERMAL Eagle comes from a family of thoroughbreds. Designed by Mark Allen, it's based on the successful Falcon design that won the Masters Soaring Competition three consecutive years and the Nationals two years in a row. The Thermal Eagle uses the same fuselage as the F3B Eagle that Joe Wurts—one of the world's best soaring pilots—used to win the 1991 F3B World Championship. Joe also flies the Thermal Eagle extensively in competition throughout the USA and does exceptionally well with it.

When Mark Allen, owner of Flite Lite Composites*, decided to concentrate on designing rather than manufacturing sailplanes, Airtronics was on hand to take over his fine line of sailplanes and electric aircraft. Airtronics' Specialty Division has made many improvements to the already good line of kits. The original SD8000 airfoil on the Thermal Eagle has been replaced by the more popular RG15 airfoil. Many people felt that the SD8000 was too sensitive to minute center-of-gravity (CG) changes that required the Thermal Eagle to be flown at a faster-than-normal speed for maximum efficiency. Unlike the earlier model, the fiberglass fuselage now has Kevlar reinforcement throughout its length rather than only in the tail boom.



Paul Wohlrab hand-launches the Eagle.

To make the wings even more efficient, their trailing edges, which are fiberglassed top and bottom under the obechi sheeting, can be sanded to a razor-sharp edge. The plywood wing-root ribs, which had to be fitted and epoxied to the main wing panels, now come epoxied in place under the wing sheeting. To speed up construction, the kit comes with routed-out flaps, ailerons and four servo bays.

SPECIFICATIONS

Model name: Thermal Eagle

Manufacturer: Airtronics Specialty Division

Type: *high-performance sailplane*

List price: $399.95

Wingspan: 118 in. (3 meters)

Wing area: 916 sq. in.

Weight: 68 to 72 oz.

Wing loading: 10.68 to 11.32 oz./sq. ft.

Length: 52¾ in.

No. of channels req'd: 6

Radio used: Airtronics Vision

Airfoil type: RG15

Aspect ratio: 15.2:1

Washout built into wing?: no

Wing construction: white foam-core wings sheeted with obechi wood; internal wing spars and carbon-fiber/fiberglass reinforcement.

Kit construction: fiberglass fuselage and canopy, composite stabilizer, built-up rudder.

Hits
- Exceptional workmanship.
- Highly detailed, easy-to-understand instruction manual.
- The flight performance exceeded expectations.

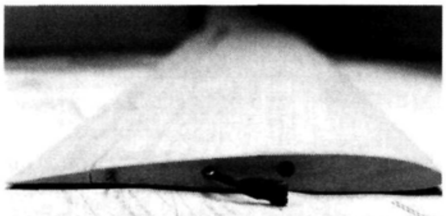
Misses
- None.

The biggest complaint from the builders of Flite Lite's earlier kit was that there was no instruction manual. Airtronics includes a highly detailed, 13-page instruction manual. There is also a signed check-off list that has the quality controller's ID number on it.

The kit also includes:
- An epoxy/fiberglass fuselage and canopy.
- White foam-core wings and stabs sheeted with obechi wood. The wings have box spars made up of two plywood webs and are reinforced with carbon fiber on the top and the bottom that extends over ¾ of the wing. The brass wing rods are also installed and aligned in the spars. The stab halves have the brass tubes for the pivot wires installed and aligned. Balsa wood is used for the wingtips, stab tips and built-up rudder. Basswood is used for the leading edge, the aileron and the flap facing.

PHOTOS BY SAL IASILLI

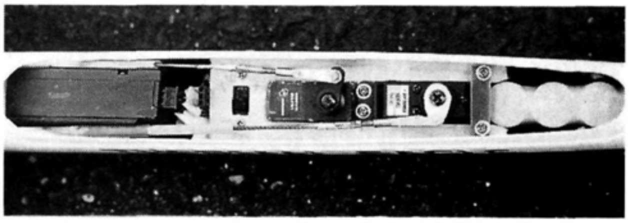
• A complete hardware package that includes control tubes, cables, quick links, clevises, threaded rods, control horns for the flaps, ailerons, rudder, a heavy-duty tow-hook, a bag of "flox" (cotton fibers) and fiberglass tape.
• Aircraft ply for the servo tray and tow-hook mount.
• A molded elevator bellcrank.
• A hardened-steel wing rod.
• Clear Mylar hinge tape and Mylar gap seal.
• Detailed, computer-drawn plans.
• Even a maple sanding block with 80-grit sandpaper.



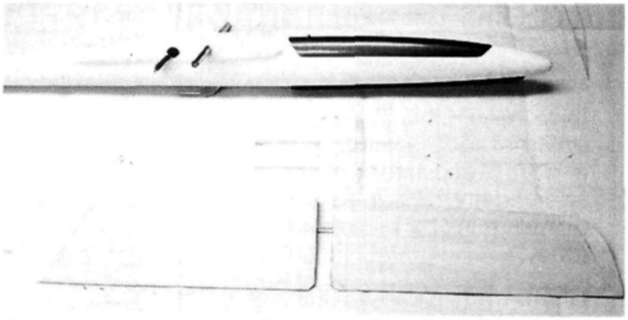
Left wing root shows servo extension placement.

CONSTRUCTION

Wings. The un-routed parts of the ailerons and flaps need to be cut free of the main wing panels. Sand the remaining spacers (that hold the ailerons and flaps to the main wing panel) flush with the rear of the main wing panels and the front of the control surfaces. Cut the control surfaces at $23^{3}/_{4}$ inches from the root end. So that you can match them to the correct wing panels, be sure to label the flaps and ailerons "right" and "left." Use aliphatic resin to glue $^{1}/_{8}$x$^{1}/_{2}$-inch basswood facing to the leading edge of the flaps and ailerons and the trailing edge of the main wing panels. To prevent them from warping, weight the control surfaces down on a flat board for at least 8 hours, and then sand them to the angles shown on the plans. Cut the balsa wingtips to shape and, using 5-minute Z-Poxy*, attach them to the outer winglets. Also epoxy the basswood LE at this time. After the balsa wingtips have been sanded to their final shape, make them damage resistant by saturating them with thin Zap* CA.



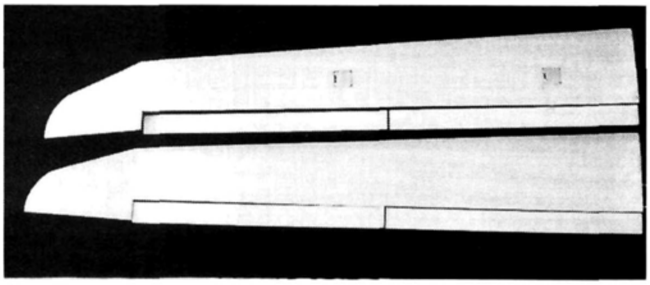
The narrow fuselage makes radio installation tricky.



Completed elevator halves in the foreground and finished forward fuselage showing the wing root and canopy.

Stab and rudder. Because the stabs, like the wings, are pre-sheeted, you only need to glue and sand the $^{1}/_{8}$x$^{1}/_{4}$-inch basswood leading edge and the $^{3}/_{8}$x$^{1}/_{2}$-inch balsa tip blocks.

To save weight in the rear of the fuselage, the rudder is built-up out of balsa and basswood, and thin Zap CA is used to assemble it directly over the plans. Then sand and shape it to the outline on the plans.



Wing halves laid out showing connected wingtips and position of ailerons and flaps.

Fuselage. Because the fuselage is a mere 1.6 inches at its widest point, you must plan carefully before you install the inner components. Epoxy the control cable housings for the rudder and elevator into place at the locations shown on the plans. Secure the housings inside the fuselage with fiberglass cloth (provided in the kit) and 30-minute Z-Poxy.

Next, install the stab control horn, the control cables, the $^{3}/_{16}$x$^{1}/_{2}$-inch balsa rudder post and the $^{1}/_{4}$-inch plywood tow-hook mount.

FLIGHT PERFORMANCE

To achieve the correct balance, I poured 7 ounces of lead shot mixed with Z-Poxy resin into the plane's nose. The wings' lateral balance varied by 4 grams; the right wing was heavier. To make the lateral balance perfect, I used large Thermal Eagle graphics on the lighter wing panel.

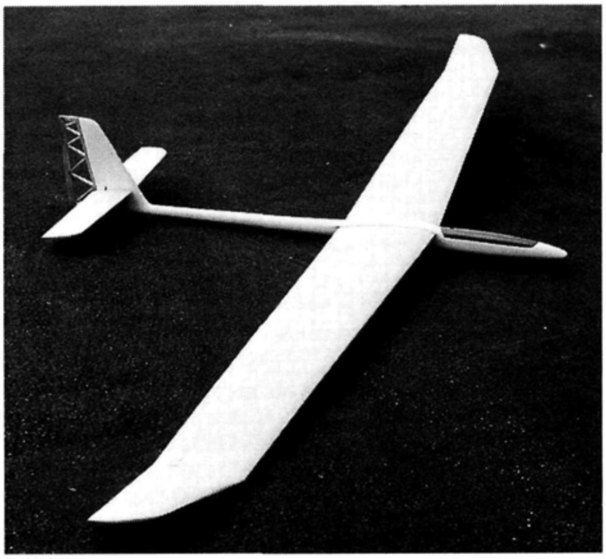
The recommended starting setups of the control throws are as follows:
ailerons—$^{3}/_{4}$ inch up, $^{3}/_{8}$ inch down ($^{3}/_{8}$ inch down for launch)
elevator—$^{3}/_{8}$ inch up, $^{1}/_{2}$ inch down ($^{3}/_{8}$ inch down with full flaps)
rudder—$1^{1}/_{2}$ inch right and left (1 inch with full aileron mix)
flaps—70 degrees for landing (1 inch down for launch)
camber—$^{3}/_{32}$ inch down with full up-elevator.

• Takeoff and landing
Takeoff on the winch launch is steep and predictable and with no squirreling. Landing in the crow mode (ailerons up, flaps down), the Eagle can descend at a very steep angle without building up speed or stress on the airframe; that makes precision spot landings a breeze.

• High-speed handling
One of the assets of its super-streamlined design is that, with a little down-trim, the Thermal Eagle can be pulled out of sink at exceptionally high speeds. As long as the CG is correct, stall characteristics are minimal. To avoid stalls in strong lift, use a slightly higher thermalling speed.

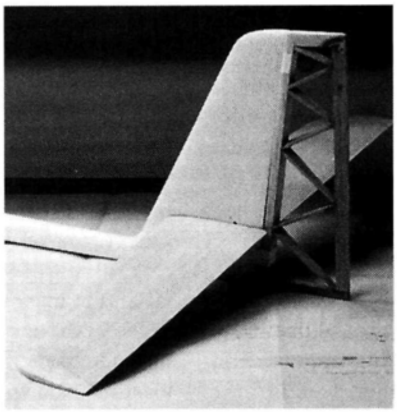
• Low-speed handling
With the flaps slightly deployed and with minimal down trim, a respectable low speed can be obtained while thermalling in light lift. When the Eagle begins to stall, the nose will rise and one wing will drop. Applying down-elevator quickly will increase air speed, and normal flight will resume.

• Aerobatics
Because the Eagle is so aerodynamically clean and fast, aerobatics such as axial rolls, loops, Immelmann turns and even Cuban-8s are all possible—provided there is enough altitude. The Thermal Eagle is exceptionally strong and will withstand many seasons of vigorous contest flying.



Assembled framework prior to covering.

Alignment of wings and fuselage. For flight performance, it's crucial that the wings and the fuselage are aligned properly. Slip the main wing joiner rod through the pre-drilled holes in the fuselage wing roots. Then mount the wing panels to the fuselage, and tape them into place. Mount the stab to the fin, and looking from the front of the fuselage, check the alignment between the wings and the stab. Once the wings have been aligned, remove them from the fuselage and enlarge the joiner holes so that they will accept the 3/8-inch-diameter brass joiner tube. Per the plans, make the cutouts for the wing servo wiring at the fuselage wing root.



Completed tail surfaces shown temporarily attached to the fuselage.

Check the alignment with the 3/8-inch-diameter brass joiner tube in place, and apply a spot of 5-minute Z-Poxy to each side of the brass tube inside the fuselage. Remove the wings and wing rod. Use a mixture of slow-drying epoxy and flox, which is included in the kit, to form a fillet around the 3/8-inch-diameter brass tube inside the fuselage. When the epoxy has cured, align the rear 1/8-inch brass wing joiner, install it, and epoxy it in the manner previously explained.

RADIO INSTALLATION

Because the wing section is very thin, micro-size servos for the ailerons and the flaps, such as the Airtronics 141, are a must in the wings. The rudder and aileron servos must be fitted one behind the other in the fuselage. The receiver is mounted directly behind the servos. A special 600mAh battery pack made specifically for the Thermal Eagle by SR Batteries* fits easily in the tapered nose.

FINISHING AND COVERING

Sand the fiberglass fuselage with 150-grit sandpaper until there's no more shine, and then vacuum it. Fill the seams and pinholes with auto-body glazing putty, and when they've dried, sand them with 320-grit sandpaper. Spray on two coats of Lustrecoat* primer and two coats of Lustrecoat white paint. Sand the wings, the stab and the rudder with 150- and 320-grit sandpaper, and vacuum them thoroughly. Cover all the surfaces with Carl Goldberg's* Ultracote. No decals are provided in the kit; all the graphics on my Thermal Eagle were computer-drawn by Vinylwrite Custom Lettering*.

CONCLUSION

Airtronics' Thermal Eagle is a refined version of Flite Lite Composites' original model, which was a fine kit in itself. The new RG15 airfoil has enhanced the Eagle's flight performance. In the hands of seasoned pilots such as Joe Wurts, it has beaten some of the best sailplane designs in the country. My fellow club member Ze'ev Alabaster now owns the original Thermal Eagle that I built more than two years ago; he recently took home a second-place trophy in a major ESL competition. That's a great achievement for Ze'ev, who has only recently begun serious competitive flying.

If you're looking for a state-of-the-art sailplane that can make you a winner, look no further. The Thermal Eagle's winning record speaks for itself.

**Addresses are listed alphabetically in the Index of Manufacturers on page 135.* ■

by MIKE BILLINTON

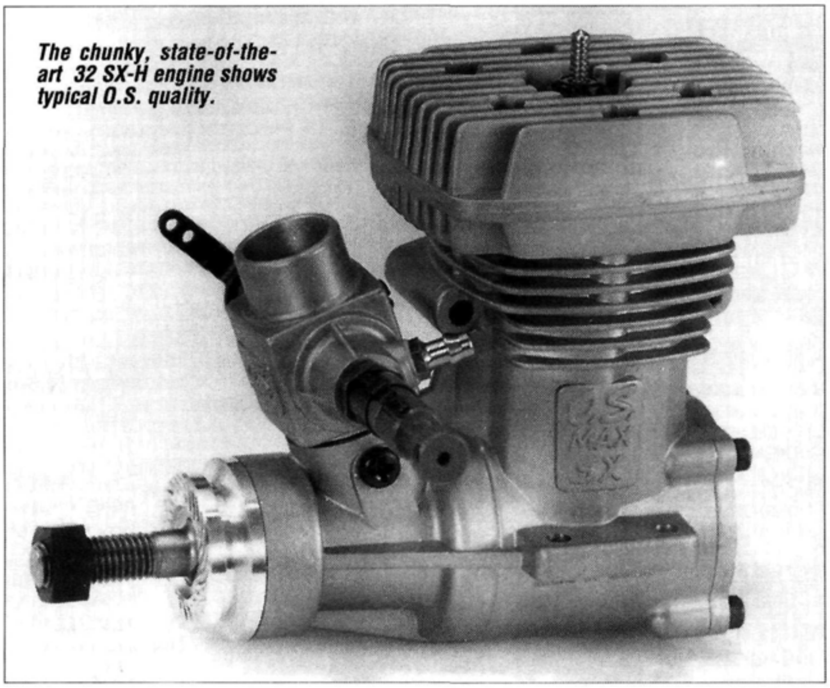
ENGINE REVIEW

O.S. Max 32 SX-H

A reliable powerplant for helicopters

IT'S FROM O.S.*, so this relatively new, Max 32 SX-H, "30-size" helicopter engine is, inevitably, a jewel. It supersedes the 32 F-H model, so I anticipated improvements in both power and reliability, and to meet current needs, its practical rpm limit is higher—22,000 (up from 17,000).

It's a clear partner of the successful larger "nitro/muffler" 10cc engines—the 61 RX-H and the 61 SX-H, and as is the case with these, O.S. makes no suggestions about muffler or tuned pipe use. Expect to see the occasional heli with the engine fitted as received, i.e., in open-exhaust form! In practice, however, it's known (via the heli "grapevine") that a generous, standard, back-pressure muffler and high-nitro fuel are the way to go (certainly, in some areas of competition).



The chunky, state-of-the-art 32 SX-H engine shows typical O.S. quality.

O.S. clearly anticipates that users (and engine reviewers) will have their own ideas about "exhaust extensions," and the range of possible combinations is broad. Note the two power graphs given here.

MECHANICAL POINTS

With the same bore and stroke as the earlier 32 F-H, but weighing 1 ounce more, the 32 SX-H looks solid (the one-piece crankcase contributes much to this). In familiar O.S. fashion, the nickel-plated liner is rotated 30 degrees within the case, and the exhaust points sideways and to the rear. This rotation improves fuel-mixture flow to the bottom of the transfer passages and reduces, by one, the number of piston circlips needed.

The usual flawless O.S. quality is again evident.

• The test engine's plain, high-silicon piston had the usual tight fit at TDC; after being disassembled and reassembled, it moved more freely when the cylinder head had been fitted and re-torqued.

• The crankshaft is of the usual very high O.S. quality, and it appears to have been nickel-plated before being finally ground to size.

• The connecting rod has the standard O.S. layout and phosphor/bronze bushings at the big and little ends.

• The engine's more substantial heat-sink cylinder head—another flawless part—accounts for most of the extra 1 ounce it weighs.

• The carburetor has the usual twin-needle fuel adjusters, and the test engine's throttle barrel isn't plated (others of this type have a cadmium-type plating).

• **Break-in.** As O.S. says: "Only a very short and simple running-in procedure is required, and this can be carried out with the engine installed in the model." O.S. can afford to take this position because of the high quality of their construction methods and the materials of which they make their engines. Before running the standard propeller rpm checks, I did my usual (very short) ABN plain-piston break-in, which was enough to ensure steady full-throttle speeds.

TESTING TIME

• **Test 1. Open exhaust.** *Fuel: 5 percent nitro with 12 percent ML70 synthetic and 6 percent castor oils. Glow plug: O.S. no. 8.* Rpm ranged from 7,000 to 23,000 and showed the customary wide, flat torque band that's typical of today's racing 2-strokes. Fitted with a carb with a larger bore (7.47mm is standard), higher rpm could doubtless be obtained. The final best horsepower figure of 1.15 at 20,850rpm is in line with O.S.'s claim of 1.2hp at 18,000rpm. (The earlier 32-H engine produced 1.02hp at 16,000rpm.)

• **Test 2.** *Muffler: K&S* RS expansion muffler. Fuel and glow plug as in Test 1.*

PHOTOS BY MIKE BILLINTON

From Japan, this superbly machined, standard back-pressure muffler has the internal volume necessary to cope with high-nitro fuel, but for this first run-through, I used a mild 5-percent nitro. The muffler is unusual because it's totally machine-turned and has threaded connections; it's easy to disassemble it for cleaning, and it can be oriented in the helicopter in a number of ways.

With this muffler, top torque and horsepower values were significantly repressed; but unlike what you'd expect with the smaller volume of usual mufflers, there was no sign of the common "brick-wall effect," i.e., increases in rpm choking off power. The muffler's large volume clearly works (at least, when using 5-percent nitro). This is confirmed by the final figure of .95hp being obtained at the *same* high-rpm point as during the open-exhaust test.

• **Test 3.** *Muffler: K&S. Fuel: 30-percent nitro. Glow plug as in Test 1.*
Using this "competition-mode" fuel/muffler combination led to high torque values that were on a par with those obtained during the open-exhaust test; .99hp was available at 17,000rpm. At higher rpm, operations became slightly ragged, and torque declined progressively. This is probably the result of the muffler's becoming increasingly unable to cope with the exhaust volume (from the higher-nitro fuel); and this became more marked after 18,000rpm had been reached. It's difficult to explain why, with this 30-percent-nitro fuel, fuel consumption continues to increase as rpm rise, but horsepower shows no commensurate increase. An increase in fuel consumption should mean an increase—not a decrease—in horsepower.

Operation was more flexible: the fuel/air ratio was much less crucial, and the engine could be successfully run at a very rich setting. These are well-known features of higher-nitro operation, and they're the reasons why cooler running is sometimes noted with higher-nitro fuels. But if operated at flat-out needle settings,

The distinctive K&S "nitro" muffler is an impressive example of machine turning.

The O.S. 32 SX-H has been fitted here with the UK's "Power" tuned pipe—a solid combo throughout the tests.

WEIGHTS AND DIMENSIONS

Capacity	0.3191177ci (5.23cc)
Bore	0.768 in. (19.52mm)
Stroke	0.689 in. (17.5mm)
Stroke/bore ratio	0.897:1
Timing periods	Exhaust—152° (angled up 15°) Transfer—120° (angled up 15°) Boost—106° (angled up 55°) Front induction —opens 33° ABDC —closes 46° ATDC Total period—193° Blowdown—16°
Combustion volume	0.51cc
Compression ratios	Geometric—11.25:1 Effective—8.25:1
Exhaust-port height	0.202 in. (5.13mm)
Cylinder-head squish	0.016 in. (0.40mm)
Cylinder-head squish angle	5°
Squish-band width	0.153 in. (0.39mm)
Carburetor bore	0.294 in. (7.47mm)
Crankshaft diameter	0.472 in. (12mm)
Crankshaft bore	0.334 in. (8.5mm)
Crankpin diameter	0.2165 in. (5.5mm)
Crankshaft nose thread	0.248 in. x 28 TPI (1/4 UNF)
Wristpin diameter	0.197 in. (5mm)
Connecting-rod centers	1.18 in. (30mm)
Engine height	3 in. (76.2mm)
Width	1.77 in. (45mm)
Length	2.85 in. (72.4mm)— backplate to prop-driver face
Width between bearers	1.22 in. (31mm)
Mounting-hole dimensions	1.496x0.59 x0.13 in. (38x15x3.3mm)
Exhaust-manifold bolt spacing	1.377 in. (35mm)
Frontal area	4.55 sq. in. (bare)
Weight	Bare: 9.9 oz. (281g) —with K&S heli muffler: 13.2 oz. (375g) —with Irvine Shuttle T. pipe: 13.4 oz. (380g) —with Irvine Shuttle muffler: 12.4 oz. (352g) —with Power Pipe: 14.05 oz. (400g)
Crankshaft weight	1.6 oz. (46g)
Piston weight	0.15 oz. (5g)

PERFORMANCE

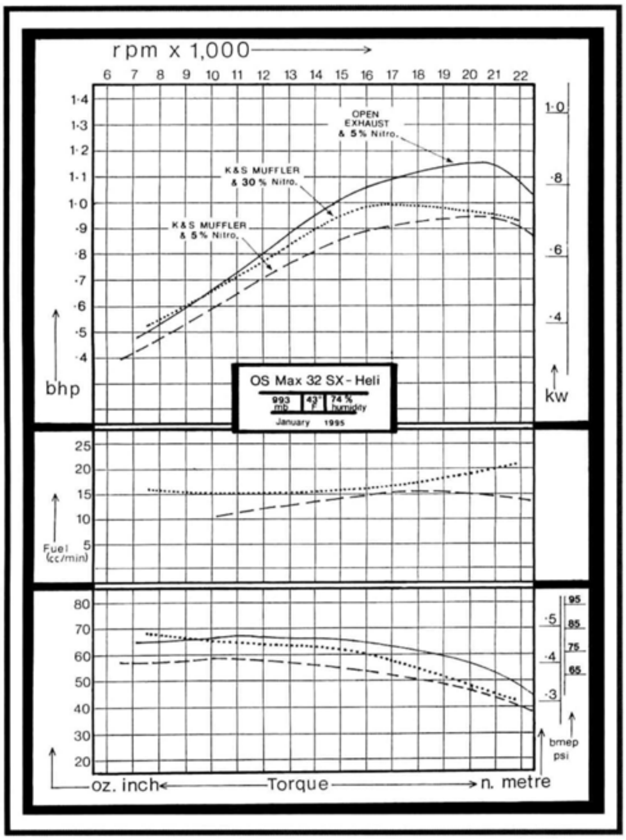
Maximum B.hp

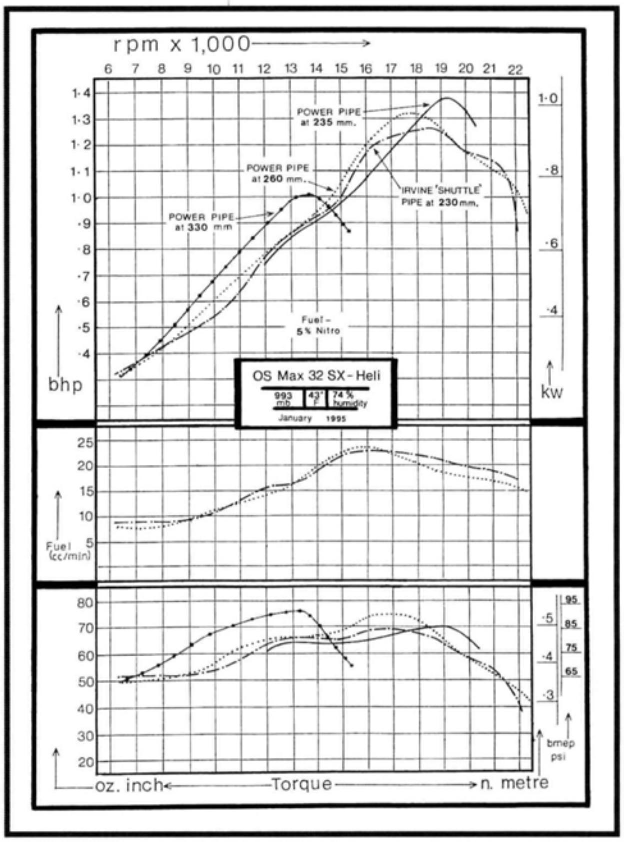
1.38 @ 19,300rpm (Power Pipe @ 235mm, 5% nitro)
1.15 @ 20,850rpm (open exhaust, 5% nitro)
0.99 @ 16,969rpm (K&S muffler, 30% nitro)
0.95 @ 20,728rpm (K&S muffler, 5% nitro)

Maximum torque

74 oz.-in. @ 16,800rpm (Power Pipe @ 260mm, 5% nitro)
68 oz.-in. @ 7,548rpm (K&S muffler, 30% nitro)
67 oz.-in. @ 11,030rpm (open exhaust, 5% nitro)

Manufacturer: O.S. Engines, Osaka, Japan.
U.S. distributor: Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104.
Power Pipe: Power Products, 50 Masefield Dr., Highfield, Stafford, U.K. ST17 9UR.





higher nitro will mean hotter running. (You can't have more power without more heat.)

• **Test 4.** *Irvine Shuttle tuned pipe. Fuel and plug as in Test 1.*
This tuned pipe was provided for the 32 SX-H by UK distributors, Irvine Engines*; an improved version is being developed.

A variety of tuned pipes (and even "pseudo" pipes) is used in the 30 heli arena, and the Irvine Shuttle pipe and Power Pipe* (of Tests 5, 6 and 7) are just two of a number of competing versions; in future tests, other designs are likely to meet my dyno in a "head-to-head." Meanwhile, the results from these two quite different designs give an indication of the extra "supercharge" to be expected from effective tuned-pipe operation. At the supplied length (with manifold) of 230mm from exhaust flange to first maximum diameter, the Shuttle pipe meaningfully boosted power, provided a usefully wide rpm band and showed a 9-percent increase in power (compared with the open-exhaust figure). Inside, the pipe has a flat reflector disk that's set back at the rear of the 3-inch-long parallel pipe section. This setup is expected to lead to a wide, flexible operational bandwidth, and, in large measure, this has been achieved. The best horsepower was 1.26 at 18,650rpm.

RPM ON STANDARD PROPELLERS

	Open ex.	K&S muffler (5% n.)	K&S muffler	Irvine Shuttle	Power Pipe
12x6 Graupner	9,353	8,890	9,210	8,280	8,619
10x9 APC	10,410	9,721	10,240	9,060	10,166
11x6 Graupner	10,940	10,320	10,830	9,740	10,748
10x6 MK Glass	11,940	11,476	12,020	11,830	12,054
10x6 APC	13,480	12,800	13,420	13,360	13,827
10x4 Zinger	14,910	14,150	14,560	14,980	15,750
9x4 Zinger	18,100	16,920	17,320	18,540	18,579
9x4 APC	18,080	17,550	18,010	18,730	18,901
8x4 Zinger	20,300	19,070	19,570	20,550	20,236

PERFORMANCE EQUIVALENTS

	Open ex.	K&S muffler (5% n.)	K&S muffler	Irvine Shuttle	Power Pipe
B.hp/ci	3.60	–	3.10	–	4.32
B.hp/cc	0.22	–	0.189	–	0.26
B.hp/lb.	1.86	–	1.20	–	1.57
B.hp/kilo	4.09	–	2.64	–	3.54
Oz.-in./ci	209.90	–	213.00	–	231.80
Oz.-in./cc	12.80	–	13.00	–	14.15
Oz.-in./lb.	108.20	–	82.40	–	84.20
Newton meter/cc	0.091	–	0.093	–	0.10
B.hp/sq.in. (frontal area)	0.25	–	–	–	–

• **Test 5.** *Power Pipe 30/40 Mk. 4. Fuel and plug as in Test 1; length set at 260mm (exhaust flange to first maximum diameter).*
This is a relatively new pipe, but it has already found favor in certain areas. Its full double-cone design offers a potential power increase, though this might be obtained at the expense of the power peak, which might become too narrow and present operators with control problems. In my test, the usable bandwidth was virtually a match for the

The 32 SX-H engine never wavered, was unusually vibration-free and had the same compression seal at the end of the tests as it had at the beginning. Fuel controls were solid and predictable, and the entire engine setup falls into the very welcome "fit-and-forget" category.

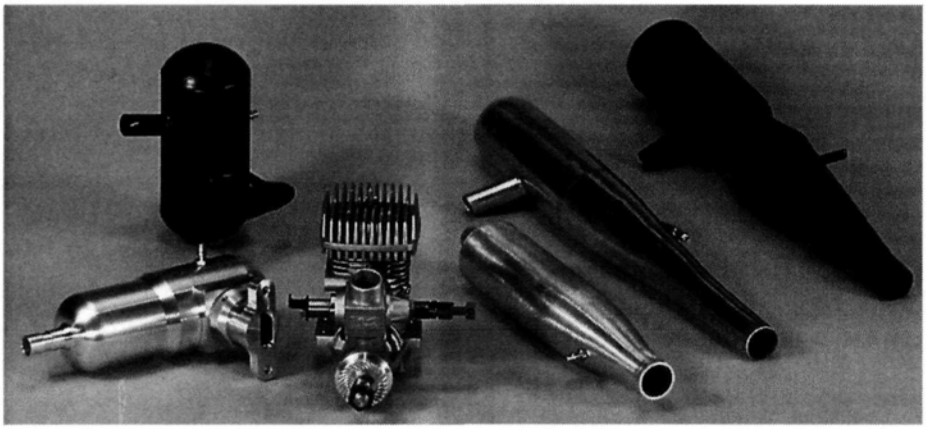
Irvine design, and there was a bonus: power was clearly increased from 15,000 to 19,000rpm. I also thought that the unusual, rear, exposed muffler-can portion reduced sound levels despite the power increase, and this is another bonus.

As the top right graph shows, the actual power peak was at 17,700rpm. I then shortened the pipe manifold to force the engine/pipe combination into full correct resonance at the higher max-rpm point necessary for certain competitive events.

• **Test 6.** *Power Pipe set at 235mm (12.99 inches). Fuel and plug as in Test 1.*
I shortened the manifold by 1 inch; this pushed the power peak up to 19,300rpm and a new horsepower value of 1.38. Shortening the manifold usually results in a torque "hole" that starts to become evident before the final leap to maximum power. tuned pipes aren't well served by unnaturally long, restrictive headers.

As before, the width of the performance band was quite satisfactory and enough for any heli requirement. Compared with the muffler/high-nitro route, however, you have to be even more certain to avoid using a mixture that's too rich; a mixture that's too rich might reduce rpm so much that the pipe "comes off resonance" and goes to even lower rpm. The alternative muffler/nitro route doesn't present this problem, and that's probably why some users find it attractive.

At various lengths, the Power Pipe exhibited very crisp, solid responses, and it seems to be quite a durable item.



With the O.S. 32 SX test engine are, from left: K&S muffler, Irvine heli muffler, Irvine Shuttle tuned pipe, Weston Genesis pipe and the Power Pipe as used for most of the tests.

Further shortening the manifold might yield even more power, but at its designed length of 260mm, the Power Pipe is the right size for most helis. It's just nice to be reminded that with most tuned pipes, one has an easily adjustable "gearbox" to hand!

• **Test 7.** *Power Pipe now set at 330mm (long). Fuel and plug still as in Test 1.*
Taking a further look at the "gearbox" facility, lengthening the header pipe by 3.8 inches (compared with Test 6) significantly filled that torque "hole"; and with the high 76 oz.-in. of torque now available at 13,000rpm, this setup would be much more suitable for those who need much lower rotor-head speeds. There's obviously a limit to how much you can alter the header's length; quite apart from the engine's efficiency in terms of rpm, good

FINAL THOUGHTS

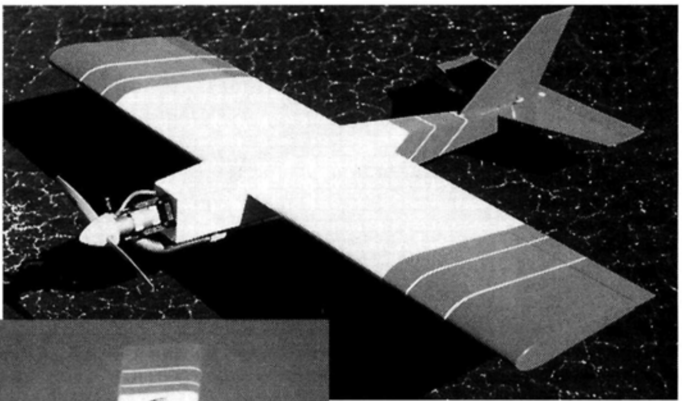
You could obviously use both a tuned pipe and, say, 30-percent-nitro fuel; it would certainly lead to more power, but you'd probably also see ragged nerve ends and reduced engine reliability. If you're into heli "drag racing," it's probably worth the risk, but for normal operations, there's an almost embarrassing power surplus—even from the 5-percent-nitro setup—when going the tuned-pipe route.

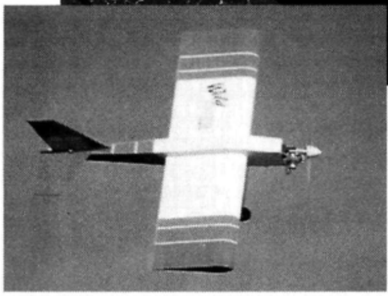
The 32 SX-H engine never wavered, was unusually vibration-free and had the same compression seal at the end of the tests as it had at the beginning. Fuel controls were solid and predictable, and the entire engine setup falls into the very welcome "fit-and-forget" category.

**Addresses are listed alphabetically in the Index of Manufacturers on page 135.* ■

GERRY YARRISH

HAVE IT YOUR WAY—MODIFY PLANS!





Designed by Tom Stryker, Wild Thing 40 (FSP04911) is a great fun-fly sport model. A one-piece design, the Wild Thing can be powered by engines with anything from a .32 to a .46 displacement. It's a great subject to modify and experiment with.

SCRATCH-BUILDING from plans doesn't mean you're locked into following *exactly* the designer's building techniques. You can't disregard commonsense practices, but you do have a lot of leeway in how you build *your* version of *his* model.

Designed by Tom Stryker and published in the April 1991 issue of *Model Airplane News* (FSP04911), Wild Thing 40 is a good example of this. This 48-inch-span, one-piece model (the wing is built into the fuse) is powered by a .35 to .45 engine, its tail surfaces and ailerons are solid balsa, and a belly hatch allows access to the radio gear.

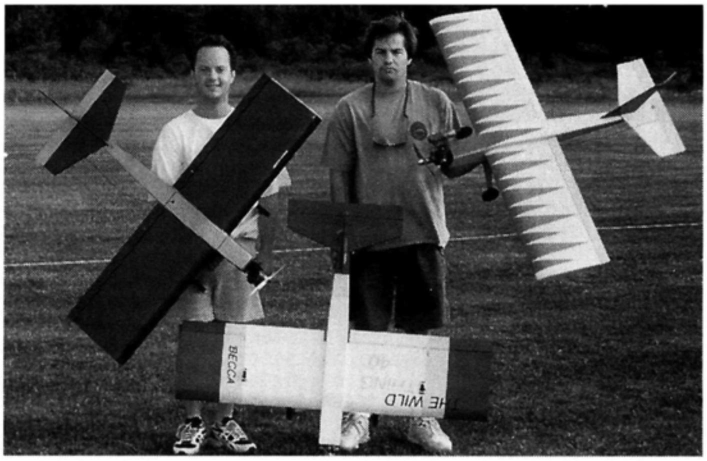
WILD THING

Such .40-size fun-fly sport models are very popular because they're usually inexpensive and easy to build and offer super performance. At a recent fun fly in Kingston, Ontario, Canada, three Wild Things showed up—all scratch-built from our plans, and all very different.

I built mine with a keen eye on weight reduction and powered it with a Webra* .32 turning an 11x4 Master Airscrew* prop. I used an Ace R/C* MicroPro 8000 computer radio that allowed me to mix the controls and to maximize Wild Thing's performance.

Dave Miles powers his Wild Thing with an O.S.* .32 turning a 10x5, and he used a JR* X-388 for control. Because Dave drives a compact car, he decided to give his model a removable wing. Thinking that the model was too short-coupled, he also placed the fin and rudder farther aft on the fuselage for—in his opinion—better stability.

The third Wild Thing was built by John Mangold, who stayed with the suggested layout and built his stock. Controlled by a JR X-388 radio, his plane is a real rocket because it's powered by a fire-breathing O.S. .46!



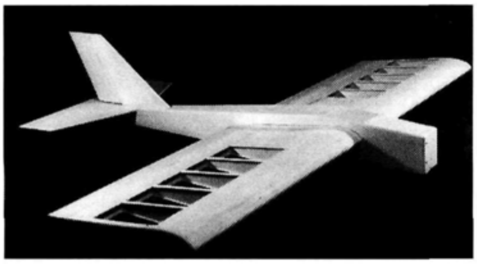
Three Wild Things; two wild pilots—Dave Miles (left) and John Mangold! These showed up at a recent Canadian fun fly—all built from "Model Airplane News" plans. Read the article to find out what makes each one different.

SIMPLE MODS

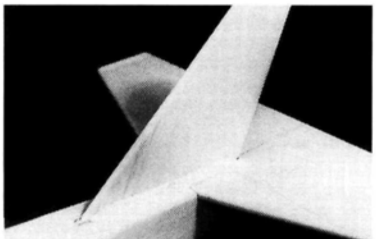
I powered my version with a lightweight engine, so I wanted to lighten the aft end of the fuselage as much as possible without affecting the model's strength. I therefore chose to build up the tail parts and the ailerons out of 1/4-inch balsa-stick stock. Figure 1 shows the vertical fin and rudder in detail. When building the ailerons, I increased the chord by 1/4 inch to get a snappier roll rate. I also replaced the 3/8-inch-square wing spars with 1/4-inch-square balsa that I reinforced with carbon fiber. This saves weight and greatly increases the wing's strength.

I saved a little more weight by replacing the bent-wire landing gear with an aluminum-sheet landing gear that's available at most hobby shops. Finally, I adjusted the positions of the radio and servos so that there was no need to add weight to the airframe to achieve the proper CG location. The servos are 2 inches forward of the position specified on the plans, and my battery pack is above the fuel tank. The plans show a 6-ounce tank, but I decided on a 4-ounce one so that I'd have room for the relocated battery pack—nothing at all complicated, but my model is 14 ounces lighter than the stock version.

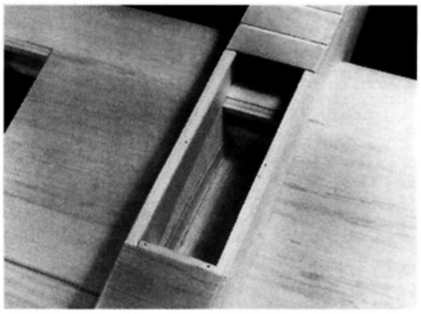
To make his Wild



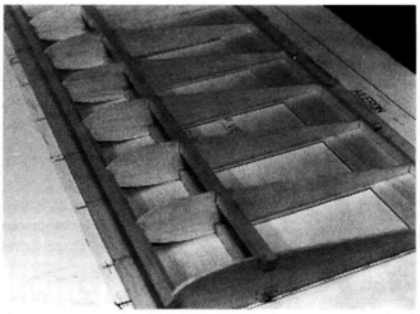
The Wild Thing 40's design is as simple as they come. Performance is very good for such an easy-to-build model.



To lighten the tail in my version, I replaced the solid-balsa parts with light, 1/4-inch balsa-stick construction.



In the stock version, a simple plywood belly hatch allows easy access to the radio equipment.



To save weight and increase strength, I replaced the rather large, 3/8-inch square balsa wing spars with 1/4-inch-square balsa spars that I reinforced with carbon fiber. Note the simple shape of the rib; it has a straight top and bottom surface aft of the spar.

Thing's wing removable, Dave Miles replaced the balsa formers F-2 and F-3 with 1/8-inch plywood. He added an alignment dowel to the center of the leading edge, and under the trailing edge, he added a plywood plate that takes a nylon mounting bolt. His modification affected servo placement (they have to be low in the fuselage to clear the bottom of the wing), and Dave also eliminated the plywood belly hatch (Figure 2).

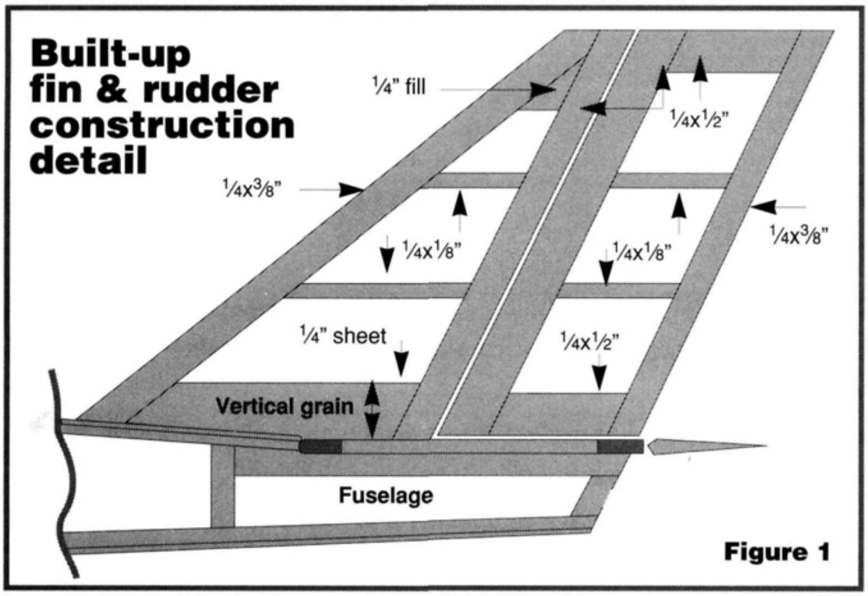


Figure 1

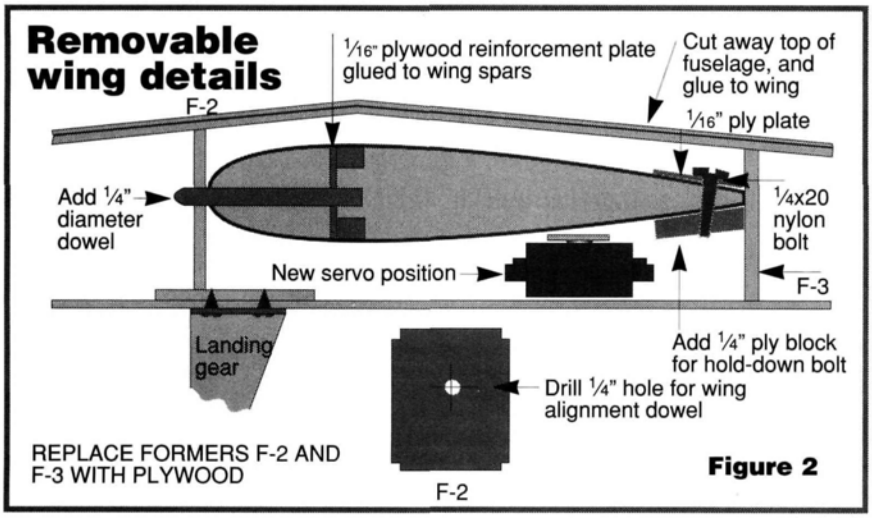


Figure 2

John Mangold's version is box-stock apart from one modification. John replaced the 3/16-inch-thick lite-ply firewall with a stout 1/4-inch-thick, 5-ply plywood firewall that will stand up to the stresses imposed by his O.S. .46 powerplant.

So there you have it: three "identical" Wild Thing 40 designs that turned out to be very different. They're all custom-built versions that suit their builder's needs, and each is unique. Don't be afraid to modify when you scratch-build. Just as we all cover and finish our models differently, so, too, can we be free to experiment when constructing our models. Keep weight and safety in mind, and you, too, can always have it *your* way.

**Addresses are listed alphabetically in the Index of Manufacturers on page 135.* ■

SCALE TECHNIQUES

GEORGE LEU

LET'S GET STARTED

I'M EXCITED to be sharing this column with Bob Underwood. I have been actively building and flying R/C for more than 25 years and scale modeling is what prompted me to learn to fly R/C.

My first R/C aircraft kit was a Sterling Models* Fokker D-7. Fortunately for me, my Dad intervened and told me to build and fly a number of trainer designs before proceeding with the D-7. I bet my story is not unique, and I want you to know the "principle" behind it is still in effect: learn to build and fly trainer and intermediate designs before progressing to scale models.

I am currently finishing a Tamecat from Altech Marketing*. I know some of you are probably chuckling to yourself about a so-called "scale authority" having a .40-size trainer in his stable, but you're missing an important point about this column. A good scale modeler needs many different aircraft. I plan to practice bomb-drop maneuvers with the Tamecat when it has been completed. I also want to try different techniques for weathering, rivet detail, panel lines and types of paint. Should I practice these things on my competition machine?—obviously not. But I do practice new techniques all the time with many diverse subjects, and I hope to encourage you to do the same.

Obviously not for the beginner, the twin engine F-4 Phantom from Bob Violett Models is at the top of the scale totem pole.

THE NOT SO GOOD OLD DAYS

In general, modelers today have many advantages over modelers of 20 years ago, for instance, the excellent quality of scale kits on the market. In 1975, Top Flite* and designer Dave Platt invented stand-off scale with the release of a P-51 Mustang. This Mustang revolutionized scale modeling because it flew like a sport ship, but resembled a scale design. The secrets of its success were compromises in airfoil shape and control-surface size and the addition of a few minor details, which enhanced its good looks and allowed docile flight handling. Top Flite designer Dave Ribbe has since redesigned and re-released the Mustang as a more scale-like, sport-flying machine. This 25th Anniversary Gold Edition aircraft would be an excellent choice for a modeler starting out in scale.

Top Flite's new 25th anniversary Gold Edition re-released P-51B Mustang is one of many kits available to the scale modeler today.

Another advantage we have today are the companies that make kits from plans. The Aeroplane Works* makes kits for the Nick Ziroli and Rich Uravitch designs. Madden Models* makes kits for all the Don Smith designs. All American Kit Cutters* makes kits for Jerry Bates designs and will custom-cut any plan into a kit. There are many other companies and individuals doing this type of work, and they allow scale modelers the opportunity to select diverse designs and kits instead of leaving us to cut everything ourselves.

DECORATIVE DECALS

What good are great kits without decals? Well, many companies offer decals, transfers and special customized markings.

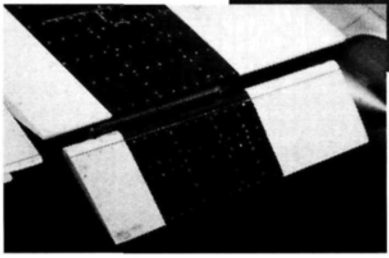
- **Dry transfers** are offered by Aeroloft*, Dry Set* and TAGS*. When applied correctly, these rub-on transfers produce a paint-like effect—with a lot less effort. The only disadvantage is that they require an overspray of clear paint to help them stick to the model's surface. Most Top Gun participants prefer dry transfers—an indication of how good they are.
- **Vinyl transfers** are not new, but they have certainly been taken to a new level by Aero FX*, which makes 0.002-inch-thick transfers with an adhesive backing. Aero FX offers a wetting solution that allows the transfers to be positioned precisely before the glue takes effect. Vinyl transfers can be custom-made by Aero FX in any color and marking that you request.
- **Water transfer decals** are still available from companies such as Major Decals* and a few kit manufacturers such as Bob Violett Models*, Jet Hangar Hobbies* and Usher Enterprises*. These types of markings have been around for a long time and are very popular because they're easy to apply.

The Top Flite Gold Edition Mustang comes with pre-cut wood and the hardware and decals are included. Twenty years ago, that was our only option for a scale kit. The few companies mentioned for kit cutting and decals and transfers can give us a lot more diversity. We now have a lot more opportunity to build scale airplanes.

KIT COMPANIES

Kits have always been available in wood and combinations of fiberglass and foam. Yellow Aircraft* and MAT* offer some of the finest glass fuselages and pre-sheeted foam wing and tail surfaces.

Yellow Aircraft's P-38 Lightning complete with Fowler flaps is a fine example of a foam and fiberglass kit that you could work your way up to building.



These kits are usually complete with hardware and scale landing gear, and that helps you build an exact scale project.

A few manufacturers have taken kits to a high level of prefabrication. AeroTech Models*, Bob Violett Models and Jet Model Products* offer designs with panel lines, rivets, mounting hardware, etc., as standard out-of-the-box features, so these kits are 85-percent complete when you take them home. You do pay a higher price for this time-saving service, but it's worth it.

If WW I interests you, companies such as Balsa USA*, Glenn Torrance Models* and Proctor Enterprises* provide a host of designs. There are many plan sets for WW I planes, and kits may be created by the previously mentioned kit-cutters.

There are many more airplane kit manufacturers that cater to diverse scale interests. Companies such as Dynaflite*, Byron Originals*, Sig Mfg.*, Carden Aircraft*, Pirate Models*, etc., offer complete kits of good flying designs. There are many more that I have not mentioned, and I apologize for that, but I will mention them in future columns.

When I think of the improvements in scale accessories including landing gear, hinges, wheels, instrument panels, ignition systems, etc., I think of companies such as McDaniel R/C*, Du-Bro*, Robart*, Ace* and Century Jet*. These types of support items were not around 20 years ago.

Radio improvements make me look back on the 1970s as if they were the Dark Ages. Companies such as Airtronics*, JR*, Hitec*, Futaba* and many others offer designs to fit your hands, your plane, small servos, large strong servos, programmed flight maneuvers, etc. You can certainly have a lot more confidence in what you fly as a result of this technology.

I hope that I have piqued your interest in scale modeling. It's an exciting time for scale modeling, and you should become part of it.

** Addresses are listed alphabetically in the Index of Manufacturers on page 135.* ■

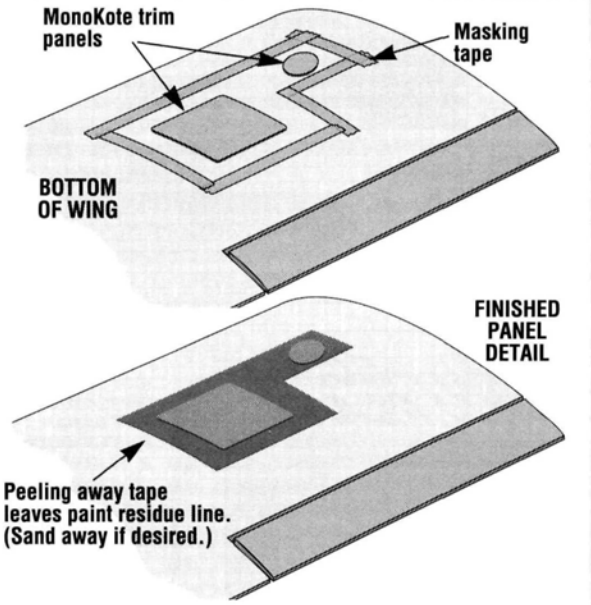
TIP OF THE MONTH

On most full-size aircraft, panels and panel lines are of different sizes and shapes. On miniature scale models, it's often difficult to discern these if they're flush with the surface of the model. I often use a variety of materials of various thicknesses for my panels and hatches.

Prior to painting, MonoKote trim sheets can be cut to size and positioned on a primed fuselage. If one were to use aluminum or gray MonoKote trim sheets, a small amount of rubbing with Scotch-Brite™ or steel wool would make the panel edges show through the painted finish. If the hatches are round, use a compass or a hole-puncher to shape them.

The 0.002-inch-thick MonoKote provides a very subtle 3-D effect when painted, and it's sure to make people take notice when it's viewed from a few feet away.

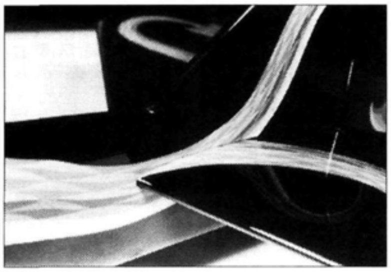
If you're timid about trying this on a prime scale project, practice on one of your more dispensable flying machines. Mask off an area on the bottom wing, and apply your MonoKote panel in the middle of that area. Re-spray the area, and you'll have accomplished a 3-D look and gained the confidence to try it on a special aircraft.



By adding MonoKote trim panels and masking off an area with masking tape, simple surface details can be duplicated with paint.

HOW TO

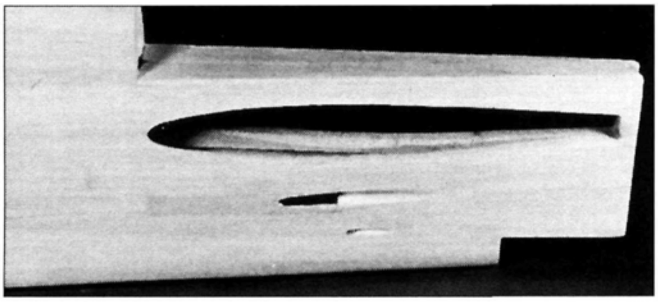
by FAYE STILLEY



Blend your fin and fuselage for a professional look

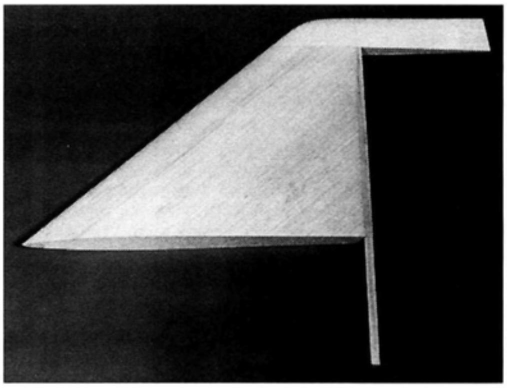
FAIR FINS

The fin and fuselage should flow smoothly together, and they will if you're willing to invest a little time and effort. Too often, the joint between the fin and the fuse gets less attention than it should. The result looks like two pieces of wood glued together rather than one part of an aircraft. Here's how you get professional results.

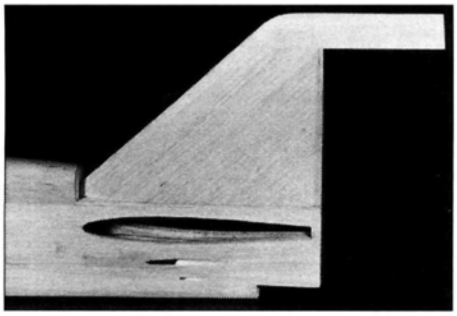


1 *Similar to many fuselages, this one has the stab mounted below the fin platform; like most, this fuse comes to an abrupt, flat end at the forward part of the fin platform.*

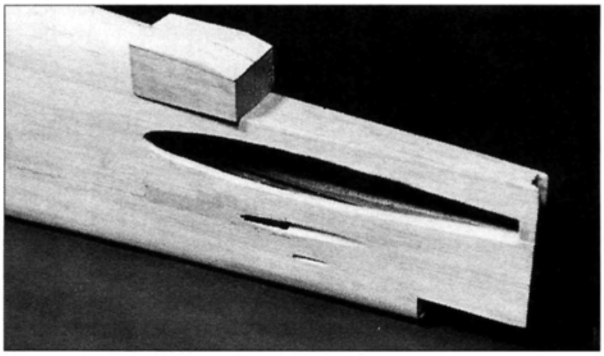
2 *The forward end of this fin narrows to a point. Either the point must be cut off, or the fuse hollowed to accept it. The turtle deck on this fuse is sheeted foam, so it was easy to hollow out. Had there been a balsa former at the end of the turtle deck, I would have cut the point off the fin.*



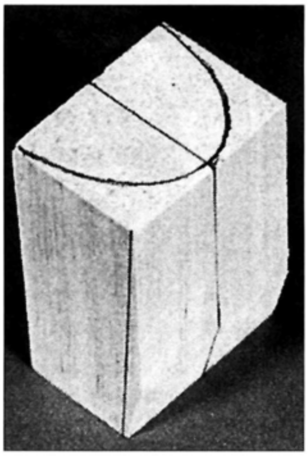
PHOTOS BY FAYE STILLEY



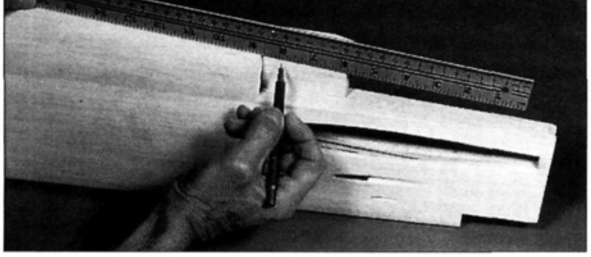
3 *When the two parts are fitted together, the fuse flares gracefully into the fin at the end of the turtle deck—sure! Not in any kit that I've ever seen. Most kit suppliers provide a block or two of balsa, which they refer to as "fairing blocks."*



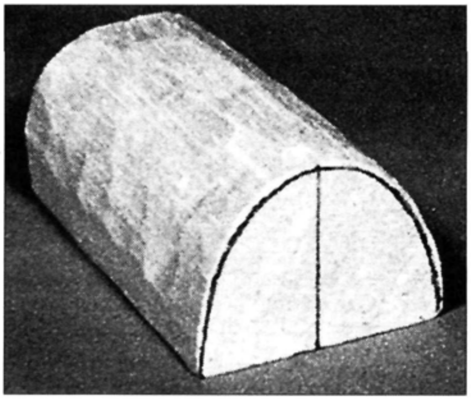
4 *The fairing block has been placed on the fuse. At this point, the kit instructions tell you to "Sand to shape." That's an understatement if I ever heard one. This block must become an extension of the fuselage and must also accept the fin's curved surfaces. And when the fin is mounted on the fuselage, you must blend the two parts smoothly together so they appear as one.*



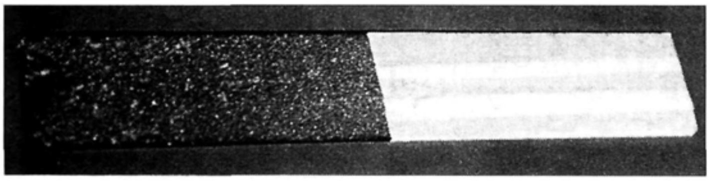
5 *OK, let's do it and make it look good. Draw a center line on the block and make a reference mark on the fuse center line. While the block is held in position, draw the shape of the fuselage on the forward end of it.*



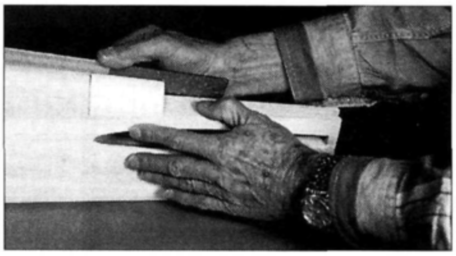
6 *Position the block so that its side lines up with the fuse center line. Then to ensure accuracy, place a straightedge on top of the fuse, and draw a reference line along the side. This line, and those we've just drawn, are our guidelines for rough-shaping the block before we permanently attach it to the fuse.*



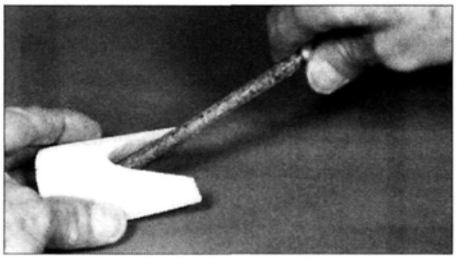
7 *The block has now been shaped to within about 1/16 inch of its final size. This particular fairing doesn't extend to the rear of the fuse because the fin's thickness tapers out to the full width of the fuse just a short distance from the fin's leading edge.*



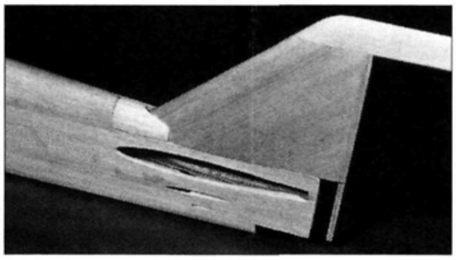
8 *Prepare your sanding tool by covering half of its length with masking tape. Use the taped side of the tool as a guide to keep the tool level with the fuse surface while you shape the block to its final size. (This will become much clearer in the next step.) To shape wood, I use Perma-Grit tools. They're made of metal and have an abrasive bonded onto one side. You could also use a straight, flat piece of wood with sandpaper attached to one side.*



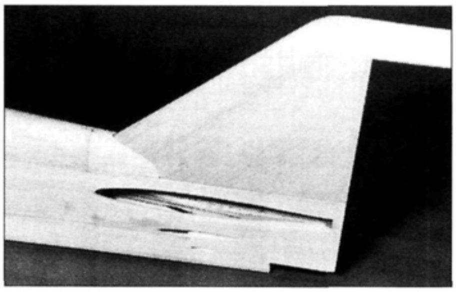
9 *Tack-glue the block into place on the fuse. Use glue sparingly, and only on surfaces that won't be on the exterior of the finished fin assembly. Hold the taped side of the tool firmly against the fuse, and draw the abrasive side slowly back and forth over the block. The masking tape protects the fuse from being inadvertently "reshaped."*



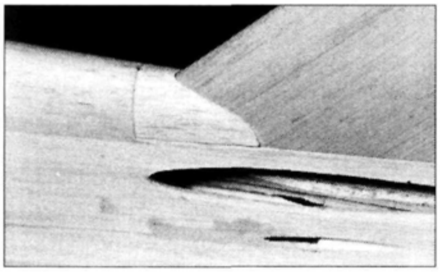
10 *The next step is to shape the slot for the fin. Start working at the center line, and use a sanding tool to slowly lengthen and widen the slot to fit the fin's leading edge. (I use a Perma-Grit tool for this, but a hardwood dowel covered with sandpaper will also do the trick.)*



11 *Here, the fin is being trial-fitted into the block. Things are looking pretty good, but there is still more work to do. Getting a tight-fitting slot for the fin will take several trial fittings to complete because the fin has an airfoil shape on the sides and tapers out at the base.*



12 *The fitting is complete. The slot was shaped until the fin's trailing edge fit flush with the trailing edge of the fuselage. Nothing has been glued into place yet because there are still a few minor details to be completed.*



13 *On close observation, you can see a tiny gap where the fin's leading edge meets the block. There's also a small gap where the block meets the fuselage. These gaps will disappear when the block is glued firmly to the fuse. Once the block has been glued into place and finish-sanded to blend with the fuse, the fin is attached. That tiny gap, at the fin's leading edge, can then be filled and sanded. When the sides of the fin have been finish-sanded flush with the sides of the fuse, everything is ready for painting or covering. Not only does the fuse flow smoothly into the fin, but the fin is also substantially strengthened by the tight-fitting fairing. The fin has become a permanent part of the fuselage.* ■

PRODUCT REVIEW

The motor to beat in AMA Class A/B competition

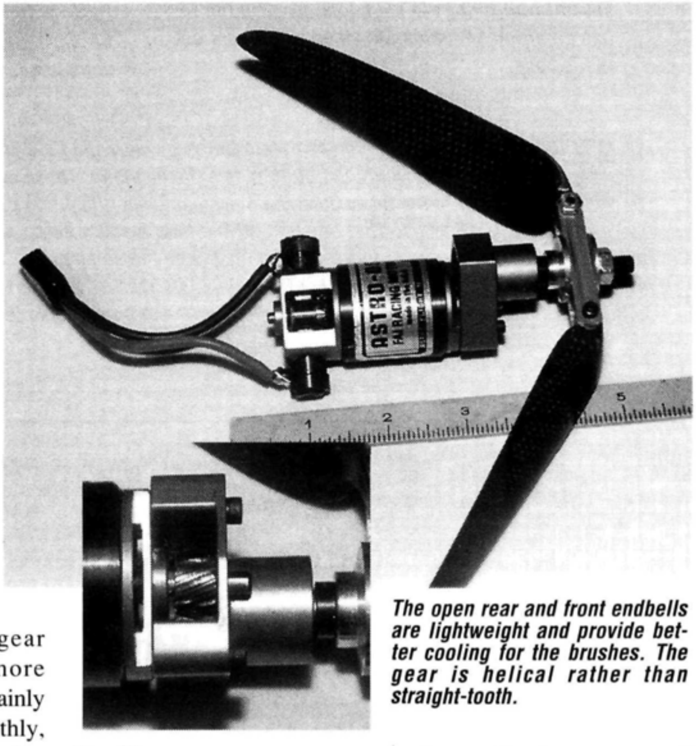
by TOM HUNT

Tom's old, reliable, modified Carl Goldberg Gentle Lady (not Electra) with the Astro FAI 05-5t installed, was used for the flight trials.

Astro Flight
FAI 05-5t Motor

ASTRO FLIGHT INC.* has added an upgraded version of the FAI 05-size motor to its already extensive line of high-power electric motors. This new motor is called FAI 05-5t, and it's available in direct-drive and 2.38:1 gear-drive versions. The gear-drive version was tested for this review; however, efficiency testing was done with the gearbox removed. Thrust testing was done with the gearbox installed. The motor is intended for short, high-amperage runs (in excess of 50 amps when tested statically). This should be the motor to beat in the upcoming season of AMA Class A/B competition electric-sailplane events.

The motor/gearbox differs externally and internally from the previously issued versions. The front and rear endbells have been machined to provide better cooling and to lighten the motor. The iron-magnet field ring is elliptically machined to tailor the magnetic field in the motor and to reduce weight. Internally, to improve high rpm running and balance, the armature "stack" has been turned so that it's smooth. The gearbox now features helical-cut gears instead of the conventional straight-tooth variety. This new gear arrangement should run more smoothly and last longer. I certainly noticed that it ran more smoothly, but as for the longer life...only time will tell!



The open rear and front endbells are lightweight and provide better cooling for the brushes. The gear is helical rather than straight-tooth.

MOTOR TESTING

Test 1. First, the motor is subjected to my normal informational tests. I acquire the dynamo constant (Kv), the armature resistance and the no-load current. This data, which is listed in the article, is good to have when you run some of the new computer programs that assess electric model performance, such as AERO*COMP* and Electro Flight Design*. If the manufacturer supplies the data with the motor and my tests confirm those values, then it also gives me the confidence that my test equipment is functioning properly. If the manufacturer doesn't furnish this information, I first check the testing apparatus with a known motor.

Test 2. The next round of tests develop an efficiency curve for the motor over its "normal" throttle range. This data provides an idea of where and how this motor could be utilized. Will it be used as a high-powered competition motor for sprint-type events (maximum efficiency in the 30 to 40A range); a sport motor with a relatively wide efficiency range (20 to 30 amps); or an endurance motor (maximum efficiency at or below 15 amps)?

Test 3. The last set of tests assess how well this motor absorbs power and creates thrust using off-the-shelf fixed and folding propellers (in this case, because of the motor's intended use, only folding propellers were tested). This data is tabulated for comparison with fixed propellers. Only those props at my disposal that drew the intended current (near or approaching 50 amps) are listed.

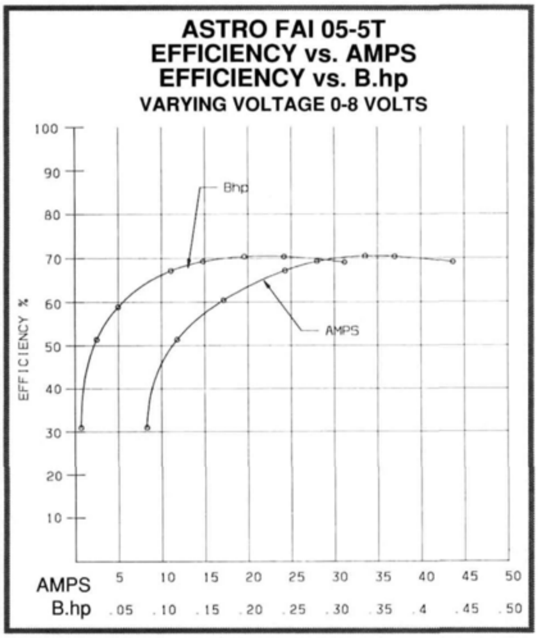
RESULTS OF THE TESTING

From the graph, it's evident that this motor was designed and configured (timed) to be most efficient with an amp draw in the high 30s. Although the overall efficiency is only around 70 percent, this is a typical level at these currents on the smaller Astro motors. What's more impressive is that the efficiency curve is fairly flat in the upper amp region. This will allow the modeler to choose from a wide selection of props and still obtain maximum transfer of power to the model. You can expect efficiency to climb slightly after the motor has been "run in"; however, after continual hard work, efficiency will fall. Peak motor performance can usually be regained by cleaning the motor and installing new brushes.

The chart of thrust levels really woke me up!

On a freshly charged 7-cell, 1000mAh pack, the motor is capable of producing 50 ounces of thrust! Because a well-built Class-A

PHOTOS BY TOM HUNT



SPECIFICATIONS

(as measured by the author)

Name: Astro FAI 05-5t

Part nos.: 608G (gear drive); 608 (direct drive)

List price: $209 (gear drive); $169 (direct drive)

Diameter: 1.25 in.

Length (bearing to bearing): 2.3 in.

Width across brushes: 2.10 in.

Shafts
—motor: 5/32 inch diameter
—gearbox: 1/4-28 thread

Weight (w/gearbox and connector): 7.9 oz.

Armature: 5 turns no. 18 wire 7 segments

Kv (rpm/volt const) as received (advanced timing): 3242

Armature resistance: 0.023 ohm

No-load current (7 cells) as received (advanced timing): 9 amps

Hits
- High-quality workmanship.
- High power output.
- Flat efficiency curve at high power.
- Low weight system.

Misses
- None.

Propeller Test Results

Prop	Volts	Amps	Rpm	Thrust
13x7½ MAP	6.03	46.7	6,900	50
12½x7 MAP	6.00	42.3	7,200	48
13x7½ Sonic	5.70	48	6,200	46
11½x7 Aero	6.23	42	7,100	44
12x7 Aero	6.26	38	7,400	42
12.5x6.5 Aero	6.09	45	7,200	44
10.5x6 Aero	8.22	47.7	9,300	55
10x7 Aero	8.22	48.5	9,300	34 (prop stalled)
9.5x5 Aero	8.80	37.4	11,300	40

MAP = Model Airplane Products (France)
Aero = Aeronaut
Sonic = Sonic Tronics*

ship weighs between 38 and 42 ounces, you can expect nearly vertical performance. (Remember, a prop loses thrust as it accelerates, and as these sailplanes climb at 20 to 30mph, thrust levels will probably fall to nearly the weight of the model.) This is from 6 to 8 ounces more thrust than Astro's earlier 5- and 6-turn FAI motors swinging these same props.

On 10 cells (an appropriate number for Class B), this motor produces greater thrust in proportion to the weight that's added (a 5-ounce thrust gain for a 3-ounce weight gain on the three extra cells). More important, the prop spins much faster, and that provides the higher climbing speeds that are necessary to get the plane to the same altitude in 30 seconds (Class B) as it gets to in 45 seconds (Class A) on 7 cells with a larger, more slowly turning prop.

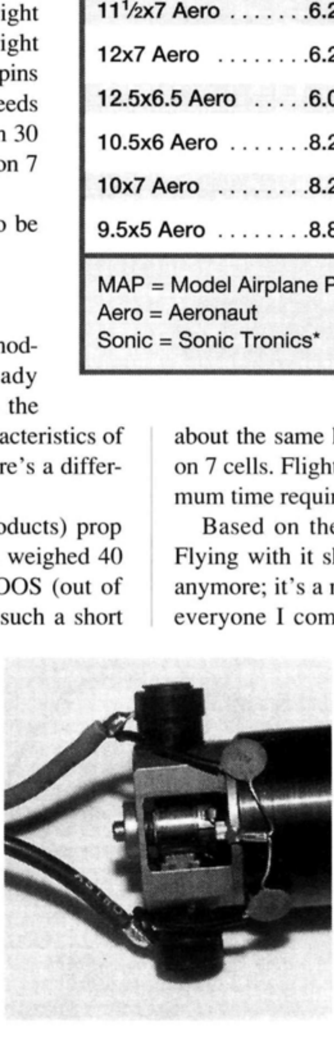
It was time for the data from the thrust-load tests to be tested in flight.

FLIGHT TESTING

The motor was flight tested in my old, faithful, highly modified 12-year-old Carl Goldberg Models* Gentle Lady sailplane (well, the wings and tails are 12 years old; the fuselage is only 3 to 4). I know the climb and glide characteristics of this model so well that I can immediately see when there's a difference in motor performance.

First up was the larger MAP* (Model Airplane Products) prop (13x7½) on 7 cells. With a 1000mAh pack, the model weighed 40 ounces. The first climb-out on a 45-second run was OOS (out of sight!). The Gentle Lady had never been that high in such a short time before. Because there were no lifts or sinks present, the flight time was a respectable 8:15 (an 8-minute minimum flight time, including motor run, is required for maximum points).

In similar weather conditions, the second flight was made on a 10-cell 1000mAh pack with an Aeronaut* 10.5x6 prop; the model weighed 45 ounces. The launch and climb were even more spectacular, but because Class B (8 cells or more) only allows a 30-second motor run, the model was only at about the same height at the end of the run as it was in 45 seconds on 7 cells. Flight time was again just about 8 minutes (also the minimum time required for Class B).



The Astro FAI 05-5t with a new helical gearbox and an Astro zero-loss connector

Based on the data alone, this motor appears to be a winner. Flying with it showed me that winning isn't a matter of hardware anymore; it's a matter of pilot skill (assuming that after this review, everyone I compete with buys one of these motors). This motor gives the flier the potential to get high enough (in either class) to make "max" flights in no-lift conditions. *(It might be time to amend the rules!)* With this motor installed, a light, strong, converted, 2-meter sailplane such as the Gentle Lady can make even the pure soaring enthusiast envious!

[Editor's note: Tom Hunt recently used this motor to take first place at the Nationals in Class A Electric Sailplane and second in Class B.]

**Addresses are listed alphabetically in the Index of Manufacturers on page 135.* ■

HOW TO

Improve your model's flight performance and scale appearance

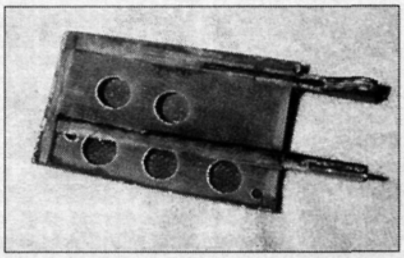
Make Mechanical Speed/ Dive Brakes

by MONT CARTWRIGHT & GENE CARTWRIGHT

JET HANGAR HOBBIES'* FJ-3 Fury, modified from their popular 1/9-scale F-86 Sabre kit, illustrates how to install servo-driven, proportional speed/dive brakes in your model. Dive brakes can be found on a variety of aircraft from high-speed modern-day jets to prop-driven WW II fighters and bombers. When deployed, dive brakes induce drag and slow the aircraft. For the aircraft to maintain air speed, power must be applied. This is important, especially for high-performance jets in battle. A warplane may need to decelerate rapidly to hit a target and then rapidly accelerate to avoid danger. Deploying a dive brake can slow a plane quickly without requiring a great reduction in engine power. Consequently, retracting a dive brake allows acceleration from a relatively higher engine power than if the dive brake hadn't first been deployed. Such power recovery is more reliable and poses less risk of engine failure.

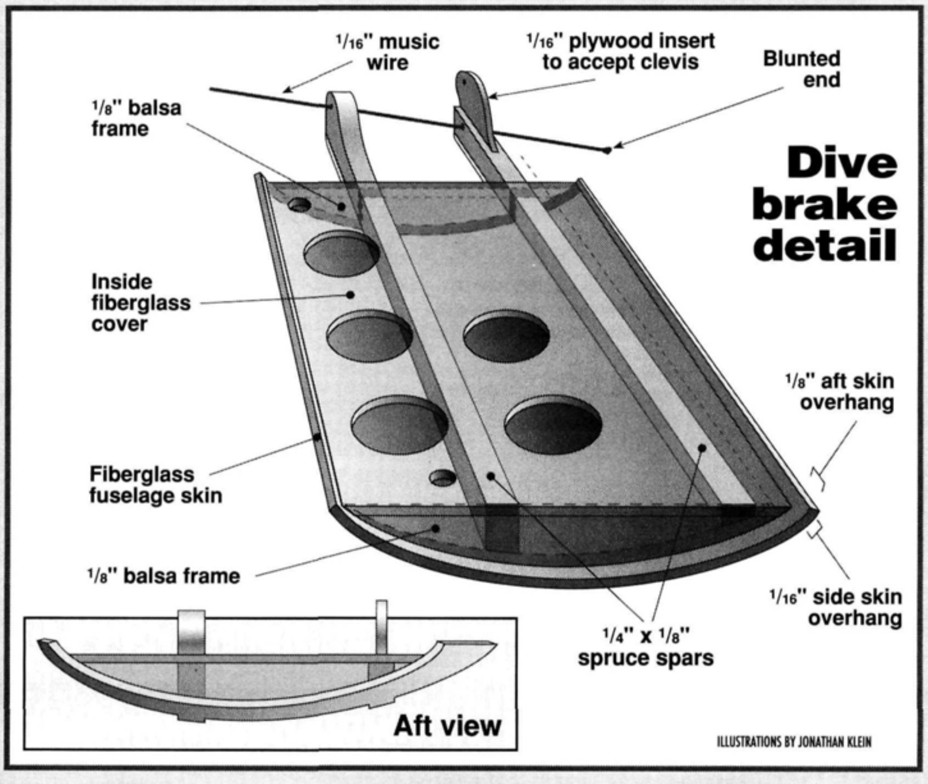
SIZE

Most jet models use a pneumatically driven cylinder/piston. This arrangement makes scale-like movements impossible. A servo-driven proportional dive brake requires additional work, but it's well worth the effort to create a scale device. Before you begin to make the brake, obtain the appropriate references to determine the dive-brake location as well as the scale parameters for excursion and angular deflection.



The dive brake is lightweight and torsionally stiff.

On Jet Hangar Hobbies' F-86 and FJ-3 Fury, the scale dive-brake position is accurately outlined on the fuselage. Use a scale model or photographs of the full-size aircraft to determine the deflection parameters as previously discussed.



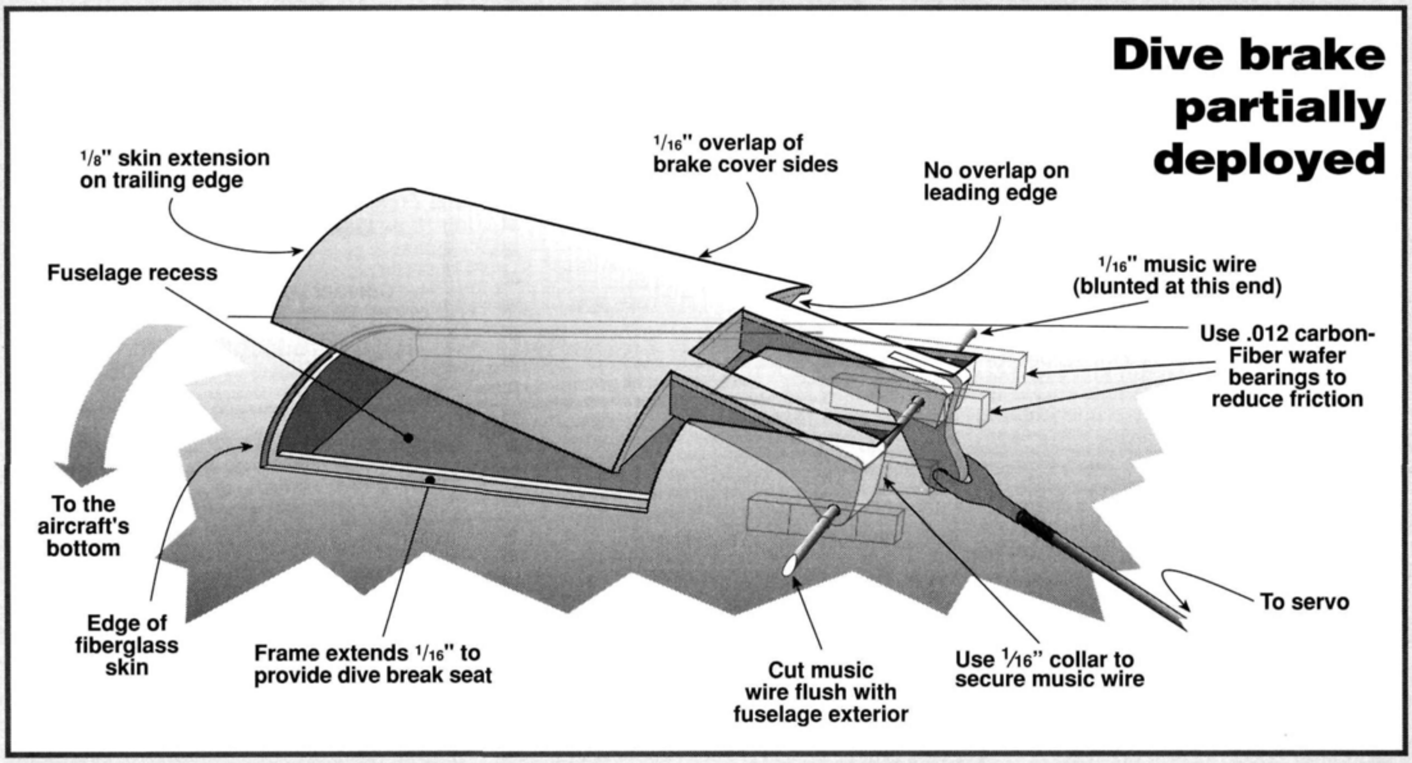
ILLUSTRATIONS BY JONATHAN KLEIN

DESIGN AND CONSTRUCTION

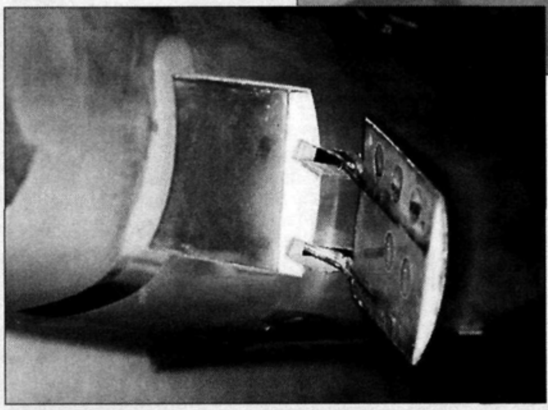
Here's how to incorporate dive brakes into your model. First, lay out the dive-brake outlines on the fuselage if there aren't any scribe lines to delineate them for you. Lay several layers of 1-inch masking tape along the dive-brake outline on the fuselage. Use a fine X-acto razor saw (no. 239) to cut the brake from the fuselage along the edge of the tape. The fore and aft edges of the cutout are framed with 1/8-inch balsa recessing only the aft balsa 1/16 inch from the fiberglass edge. Templates for the fore and aft frame pieces are traced from the fuselage sides where the brakes were cut out. This maintains the fuselage curvature on the dive-brake surface so that it fits perfectly into the fuselage.

Two spruce spars—1/4 x 3/8 inch each—are beveled at the desired angle of deployment (37 degrees for the FJ-3 Fury). This angle must be exactly the same on both dive brakes for even downward deployment. The spars extend forward inside the fuselage beyond the dive-brake cutout where the hinge and drive mechanism are on the plans. The balsa fore and aft frame pieces and spars are sanded flat to match the edge of the dive-brake fiberglass cutout. The inner brake surface is sheeted with fiberglass (note the scale lightening holes).

The depth of the fuselage recess must allow full retraction of the dive brake, give

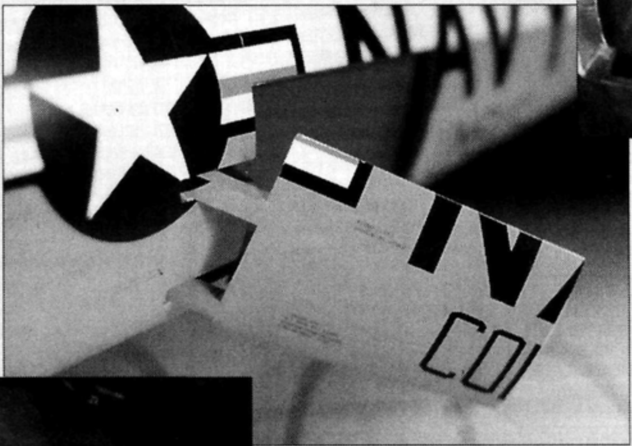


a scale appearance and provide clearance between the dive brake and the internal exhaust ducting. One-eighth-inch balsa is used to frame the fuselage recess. Note how the balsa frame protrudes ¹⁄16 inch beyond the fuselage recess except at the fore end. Beveled cuts are made in the fore framing to accommodate the spruce spars. The dive-brake cutout is taped back into position on the fuselage, and ¼-inch balsa (contoured to the curve of the fuselage) is framed around the spruce spars on the inner fuselage surface.



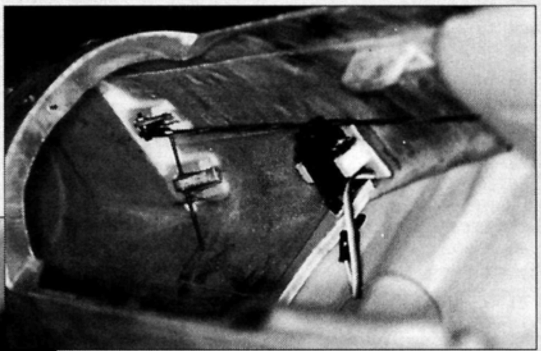
The extended brake shows the fuselage recess.

The hinge consists of ¹⁄16-inch music wire passing through a hole drilled from the bottom of the fuselage through both the spruce spars and the ¼-inch balsa frame. One end of the hinge wire is blunted to facilitate passage. The hinge is held in place with a ¹⁄16-inch wheel collar. The fuselage hole may be slightly oversize to facilitate hinge placement. The hinge is removed by releasing the wheel collar and pushing the wire out from inside the fuselage. The only visible evidence of the hinge is the small hole in the fuselage under its surface.



Completed brake in the extended position.

The drive mechanism consists of ³⁄16-inch music wire threaded at one end to a Du-Bro* 2-56 swivel ball link, which connects to the dive-brake hinge pivot arm and a solder link at the servo end. Servo throw is adjusted for desired deployment.



PHOTOS BY MONT CARTWRIGHT

Here you can see the internal linkage that drives the brake.

Remember: symmetry is critical.

The recess cavity is completed by sanding the fuselage balsa frame to ensure a flat surface for the fiberglass lining. For the FJ-3 Fury, paint the fuselage recess zinc chromate, and paint the inner dive-brake surface red. Make sure that all the wood is fuel-proof.

Scale dive brakes enhance the Fury's appearance and flight performance. Landing approaches and ground rolls were significantly shortened by 100-percent deployment. Remember to carry some power on landing because dive brakes coupled with flaps induce drag. If left unchecked, low power and full dive brakes will create a stall because the approach speed will be too slow.

A special thanks to Larry Wolfe of Jet Hangar Hobbies for his input.

** Addresses are listed alphabetically in the Index of Manufacturers on page 135.* ■

FIELD & BENCH REVIEW

Low-cost, high-efficiency, thermal sniffer

HOBBY LOBBY Timothy

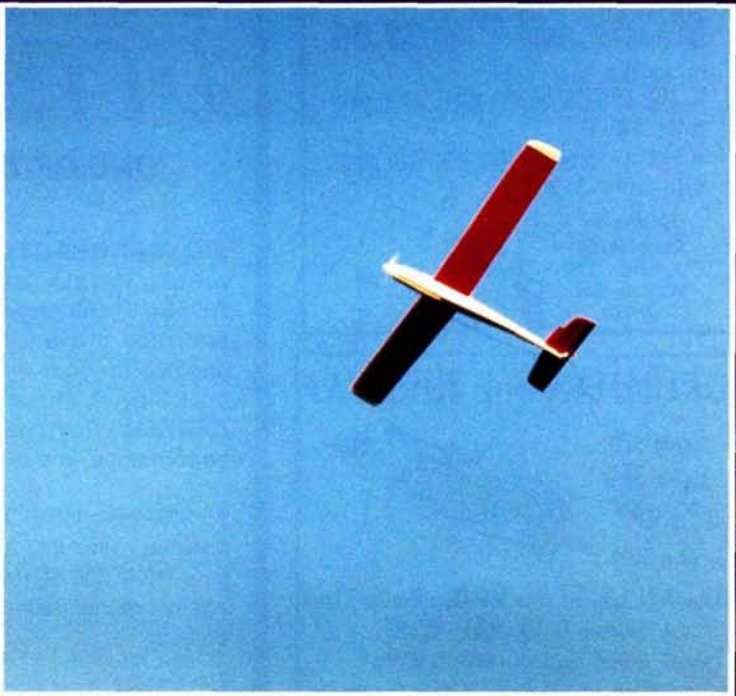
by BERNARD CAWLEY JR.

LAST WINTER, I was a new CompuServe user exploring the ModelNet area. Soon, I gravitated toward "R/C Electric Flight," since that's my major interest. Once there, I came upon a series of messages under the heading "Suitcase Airplane." The conversation was about models you could easily take on an airline trip by fitting them in a suitcase or a small box.

I had always wanted to do something like that, so I read on. It was there that Jim Martin, head man at Hobby Lobby Intl.*, introduced ModelNetters to a small almost-ready-to-fly sailplane—"Timothy"—from the Czech Republic.

Over the next few weeks, Timothy came up over and over on ModelNet. Eventually, I decided that I had to add one to my fleet. Since I have five kids, I haven't been getting much building done this year. But I really wanted to add a new plane this season, so the fact that Timothy was an ARF was very appealing. Appealing, too, was its use of the small, inexpensive Graupner* Speed 400/folding prop set. And I've always been a sucker for small planes.

So, based solely on the positive reports from fellow ModelNet members, I sent an e-mail message to Jim: "Send me a Timothy," without ever having seen one. This has *not* proven to be a mistake.



PHOTOS BY BERNARD CAWLEY JR. & SCOTT KRUIZE

THE PLANE

Well, what's Timothy, anyway? Timothy Elektro is an all-wood almost-ready-to-fly 1½-meter-span motor glider from the Czech Hacker Model Production Co. It is intended to be powered by the Graupner no. 6065 direct-drive 7.2V Speed 400 and 6x3 folding prop set (Hobby Lobby* catalogue no. GR6065). It comes completely framed and covered in red and white Oracover.

The slender fuselage is balsa sheet with occasional hardwood and ply reinforcements. The gently tapered wings are single-spar open-frame construction, and the tail surfaces are built up. The sheet control surfaces are already installed—hinged with clear tape. Also included are vacuum-formed wingtips, cowl and canopy, various control-system parts, including pushrods, a steel-wire wing joiner and a big, colorful, sheet of peel-and-stick markings. The one-sheet instructions,

SPECIFICATIONS

Model name: Timothy

Manufacturer/U.S distributor: Hacker Model Production/Hobby Lobby

Type: electric boosted sailplane

List price: $108

Wingspan: 59 in.

Wing area: 335 sq. in.

Weight: 22.3 oz. (as tested)

Wing loading: 9.6 oz. per sq. ft.

Length: 34⅛ in.

Motor/battery used: Graupner 7.2V Speed 400, 7 Sanyo 600AE Ni-Cd cells

No. of channels req'd: 3 (rudder, elevator, throttle)

Motor/battery recommended: Graupner 7.2V Speed 400, 7 AA size Ni-Cd cells

Radio used: RCD Micro 535 receiver, World Engines S-22A servos, JETI Model Co. JES 10B speed control (with battery eliminator)

Prop used: Graupner 6x3 folding

Airfoil type: semisymmetrical; no washout

Construction: single-spar built-up wing; sheet-balsa fuselage; built-up balsa tail surfaces; Oracover covering.

Features: structure completed and covered; vacuum-formed plastic wingtips, canopy and cowl; all necessary hardware and a large, colorful sheet of markings are included.

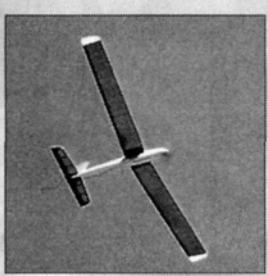
Hits
- *Good-quality construction and covering.*
- Good looks.
- Pleasant flight characteristics.

Misses
- Plastic parts a tight fit.
- No control throws given in instructions.

Timothy surprised me with how quickly it can move out; that low-drag Eppler airfoil and slim fuselage deserve credit for that. The low drag gives it the ability to penetrate wind well for such a light wing loading.

FLIGHT PERFORMANCE

• Takeoff and landing
In even a light breeze, Timothy can be launched by simply turning it on and giving it a firm toss into the wind. A positive, if not spectacular, climb is established immediately. Before too long, that 1.5-meter wing gets mighty tiny in the sky. Landings are what you might expect from a clean, lightly loaded sailplane type; a firm, but flat glide, right to touchdown. No surprises here!



• High-speed flight
Full power requires a bit of down-trim compared to power off, suggesting the need for a little downthrust. So far, I haven't bothered. With more down-trim, or in a shallow dive, Timothy can get going surprisingly quickly. At speed, controls are positive, not twitchy. You can see the wings flex a bit if you pull up sharply at high speeds.

• Low-speed flight
The rudder becomes less and less effective as Timothy slows down, especially power off (no prop blast over the tail). A touch of back stick quickens the response. It is in low-speed flight that a wing warp shows up as a reluctance to turn one way. Don't ask how I know!

Straight-ahead power-off stalls stay straight ahead, with altitude loss of three to four airplane lengths before it starts flying again. Partial-power stalls just recover more quickly. A stall in a tight turn holds no surprises—no tendency to snap out at all. Altitude can be maintained at about 50 percent power—a setting that draws only 3 amps static. This translates to only 20 watts or so input power and a potential of 12 minutes of power with a 600mAh battery.

• Aerobatics
As a motor glider, the Timothy isn't really intended to be an aerobat, but it will loop easily. It can also be held in inverted flight, just barely maintaining altitude at full power and full forward stick.

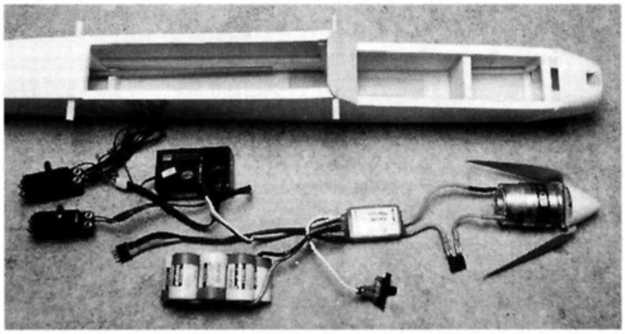
which cover both the electric Timothy and the pure sailplane version, are in Czech and English. No plans are provided or needed to complete the plane.

ASSEMBLY

All the work required to get Timothy in the air is final assembly and equipment installation. Check the wings for warps before you start; mine were slightly twisted: one washed in and one washed out. After all, they've come a long way and probably have been heated and cooled a bunch of times before they get to you. The usual heat-with-your-covering-iron-and-twist method works just fine. The plastic wingtips fit snugly; I wound up slitting the trailing edges to get them on. A wooden anti-rotation pin, glued to one wing, keeps the halves aligned when they're joined with the wire joiner.

Attach the tail surfaces to the fuselage (or make them removable for a true "suitcase airplane"), install the pushrods using the pre-marked exit locations, install the servo rails, two micro-servos and the rest of the control and power equipment, and you've finished.

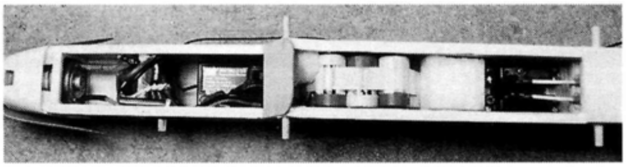
The plastic cowl serves to close up the top front of the fuselage and to retain the front of the canopy, which will need some extra trimming to fit neatly under the cowl. The cowl, in turn, needs a bit of persuading to fit all the way back on the nose. To retain the canopy, I simply loop a small rubber band across the back of it from one side of the front wing dowel to the other. This makes it easily removed to access the equipment.



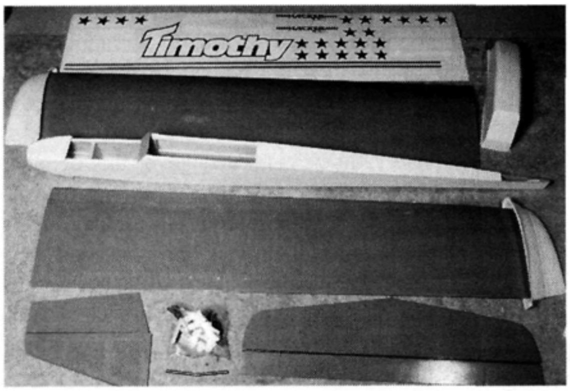
Graupner Speed 400, folding prop and JETI JES10B speed control. Note the mini blade fuse and switch.

SYSTEMS

Timothy is designed for a 7-cell pack of AA cells arranged like a transmitter pack missing a cell. Having seven 600AEs on hand intended for another project, I made up a 4x3 pack with these and saved a bit of weight. This pack fits snugly in the front of the battery area. I used some white foam blocks to fill the remaining space and prevent the battery from shifting.



The receiver, speed control and switch, motor and prop have been installed. Note the foam blocks that hold the motor battery in place.



The kit contents right out of the box. The entire kit weighs only 11.5 ounces!

Completing the equipment was an RCD* 535 micro-receiver and a Czech JETI Model Co. JES10B speed control. This unit, also from Hobby Lobby, is as small as the Astro Flight 217 Micro Series speed control; but it is high rate, has battery-eliminator circuitry, a motor cutoff (at 5.5 volts) and a brake. All the features listed, plus a radio/arming switch, are included in its 1.1-ounce ready-to-use weight. It is limited to 8 amps continuous, but that's just right for Speed 400s, and it seems tailor-made for planes like Timothy.

All up, my Timothy tips the scales at

TIMOTHY

The Timothy being held by my daughter Bea just before the first flight.

22.3 ounces, giving a $9\frac{1}{2}$-ounce/square foot wing loading. The colorful, stick-on markings account for 0.3 ounce of that, by the way. This is a bit lighter than the 650 grams (22.9 ounces) called out on the box; the kit contents weighed 11.5 ounces.

No control throws are specified on the instruction sheet. I suggest that you go for all the rudder throw you can get. About $\frac{3}{8}$ inch each way on the elevator is enough for tight loops and is just barely enough to hold inverted flight with full forward stick.

Since this motor/battery/prop combo draws only about $7\frac{1}{2}$ amps at full throttle, expect 8- to 10-minute flights without thermal assistance. These flights are a mixture of climbing and gliding, partial power cruising just lookin' pretty and a few loops thrown in just for fun.

CONCLUSION

Timothy surprised me with how quickly it can move out; that low-drag Eppler airfoil and slim fuselage deserve credit for that. The low drag gives it the ability to penetrate wind well for such a light wing loading. I've also been pleasantly surprised by the absence of sagging in the Oracover, even after leaving the plane in the trunk of the car on a warm day.

At the 1995 Boeing Hawks Electric Fly-In, a Timothy finished first on Saturday and first and third on Sunday in the 7-cell battery allotment (AMA event 609). This event requires the pilot to make three flights of exactly 8 minutes duration without charging the battery between flights. Doug Ingraham, who piloted his Timothy to first place on both days, used a pack of six, 1200AE cells that gave runs of more than 20 minutes at a "just-maintain-altitude" power setting. On Sunday, using the 7-cell 600AE pack and two good thermals, I took third place with this review model. I plan to make a 7-cell pack of 1000 AEs for battery allotment competition later in the season.

**Addresses are listed alphabetically in the Index of Manufacturers on page 135.* ■

HOW TO

Understand Aerodynamic Formulas

Simplify those mathematical equations

by ANDY LENNON

MY SERIES of articles in *Model Airplane News* reflects a deep and lifelong interest in aviation; a close study of the vast amount of timeless aerodynamic research data, both full-scale and model, that is readily available.

This, coupled with the practical application of this data to the design, construction and flying of a wide variety of model airplanes, reflects those many years of study and experience.

These models perform well, and photos or 3-view drawings of them have been incorporated into these "How To" articles.

Layman's language has been used, but inevitably some aerodynamic jargon and symbols had to be introduced.

The many charts, curves and formulas may be intimidating to those readers who are not familiar with the use of the mass of information they contain. Once actual numbers replace symbols in the formulas, only plain, old, public-school arithmetic is needed. A pocket calculator with "square" and "square-root" buttons simplifies the work.

The problem seems to be "how and from where to obtain the numbers." This article is designed to correct this. The various figures have been marked to illustrate the sources of those numbers.

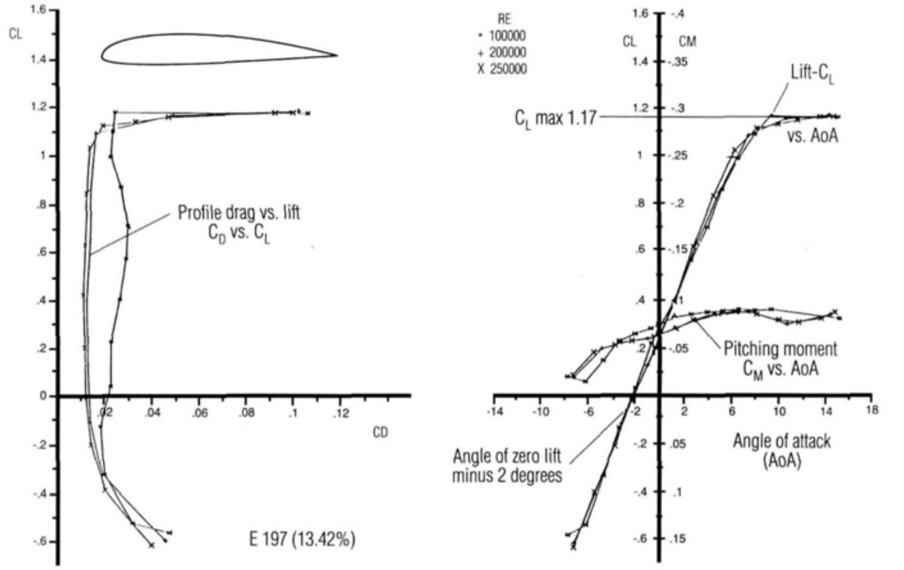


Figure 1.

The specifications of an imaginary model airplane have been used as examples.

The most important formulas deal with lift, drag and pitching moment.

LIFT

Figure 1 is the airfoil plot of the Eppler E197 airfoil section. It shows this airfoil's behavior for "infinite aspect ratio," i.e., no wingtips (references 2 and 7 in Figure 9).

Airplane wings, even very high-aspect-ratio glider wings, have "finite" ARs and do have wingtips. Lift is lost at those tips; the wider the tip-chord, the greater the loss.

Figure 2 shows that the wing's angle of attack must be increased (induced angle of attack) to obtain the lift coefficient needed as aspect ratio decreases.

Figure 3 shows that induced drag

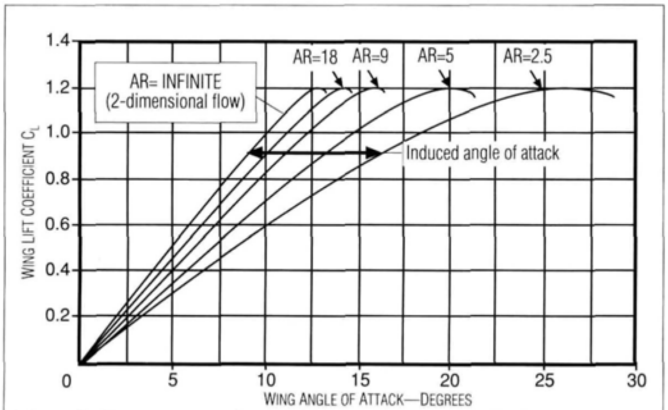


Figure 2. How aspect ratio affects the stall angle of attack.

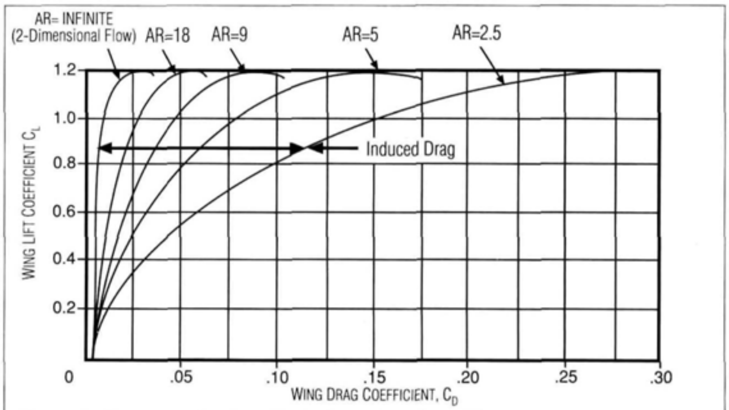


Figure 3. How aspect ratio affects drag at a given lift.

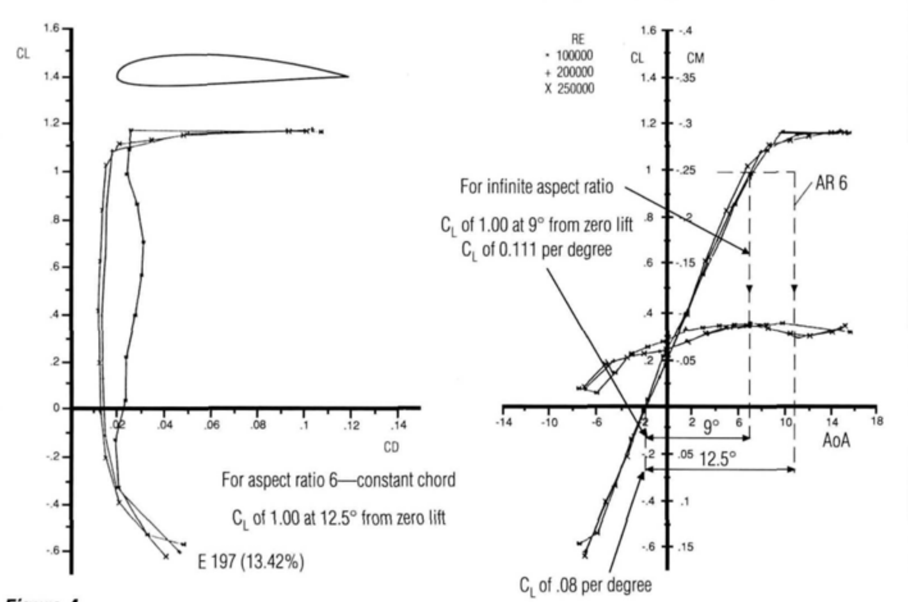
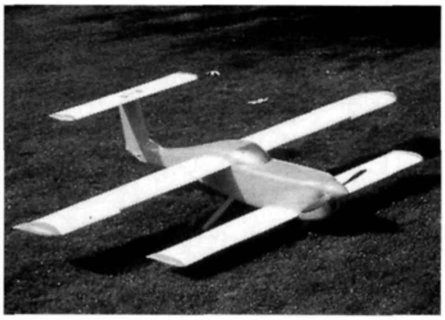


Figure 4.



The three-surface "Wild Goose" was designed to the aerodynamic and structural principles in this "How To" series; specifically an upcoming three-part article entitled, "Canard, Tandem Wing and Three-Surface Design." It's an excellent flier.

increases at low aspect ratios.

Airfoil plots, such as Figure 1, must be adjusted to:

- reflect the aspect ratio of your wings;
- reflect the wing's planform—straight (constant chord) or tapered.

An elliptical wing planform needs only the adjustment for aspect ratio.

The formula for both AR and planform adjustments is

$$a = a_o + \frac{18.24 \text{ x } C_L}{AR} \text{ x } (1. + T)$$

The symbols represent:
a = total angle of attack (AoA) needed;
a_o = "section" or airfoil plot AoA;
C_L = lift coefficient at that AoA;
AR = aspect ratio;
T = planform adjustment factor (figures 5 and 6).

Refer to figure 4.
E197 produces lift of C_L 1.00 at 9 degrees AoA, from *zero lift*, for infinite AR.

In Figure 5, a constant-chord wing of AR6 has an adjustment factor T of .17.

Replacing the symbols with these numbers:

$$a = 9° + \frac{18.24 \text{ x } 1.00 \text{ x } 1.17}{6} = 12.5°$$

Had the wing been tapered with a taper ratio of 0.6 (tip chord 7.5 inches divided by the root chord 12.5 inches, or 0.6), the planform adjustment factor, in Figure 6, would be 0.0675, reflecting the lower tip lift losses from the narrower tip chord.

A lift coefficient of 1.00 for 12.5 degrees is 1.00 divided by 12.5, or 0.08 per degree. This is the "slope" of the lift curve at AR6 and constant chord.

Our example model aircraft design has the following specifications:

- Estimated gross weight of 90 ounces;
- Wing area of 600 square inches (4.17 square feet);
- Wing chord of 10 inches;
- Span of 60 inches;
- Estimated cruising speed of 50mph;
- Wing loading of 90 divided by 4.17, or 21.6 ounces per square foot.

There are two solutions to the determination of the wing's angle of attack to support the plane in level flight at the estimated cruising speed.

SOLUTION NO. 1

Refer to Figure 7. At a wing loading of 21.6 ounces per square foot, and at a speed of 50mph, the wing needs a lift coefficient of close to 0.20.

Our wing develops a lift coefficient of 0.08 per degree AoA. To produce C_L 0.20 would require an AoA of 0.20 divided by 0.08, or 2.5 degrees from *zero lift*, which for E197 is minus 2 degrees.

The wing would thus be set at (2.5-2) or 0.5 degree AoA—and at 0.5 degree angle

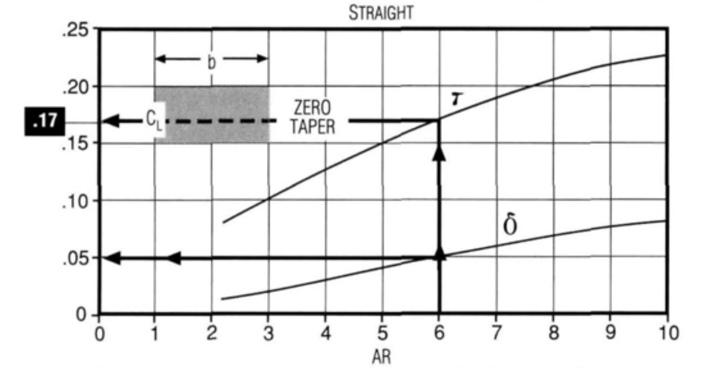


Figure 5. Straight wing correction factor for non-elliptic lift distribution.

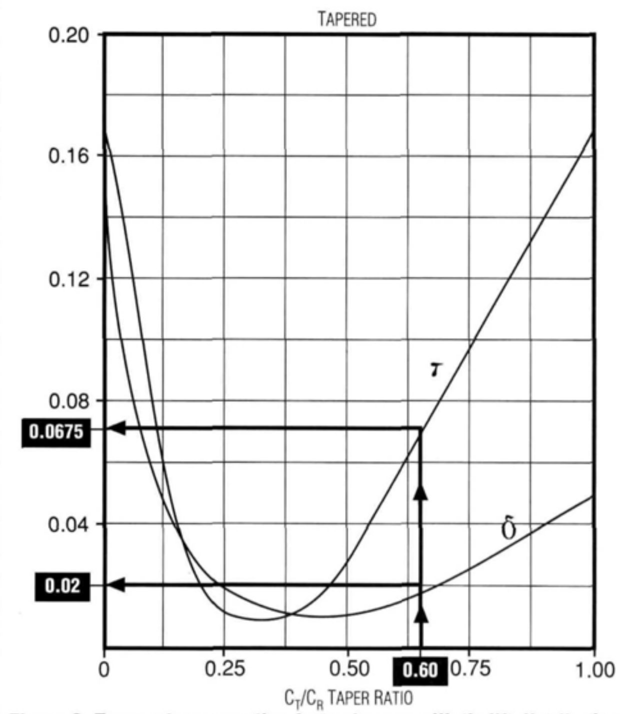


Figure 6. Taper wing correction factor for non-elliptic lift distribution.

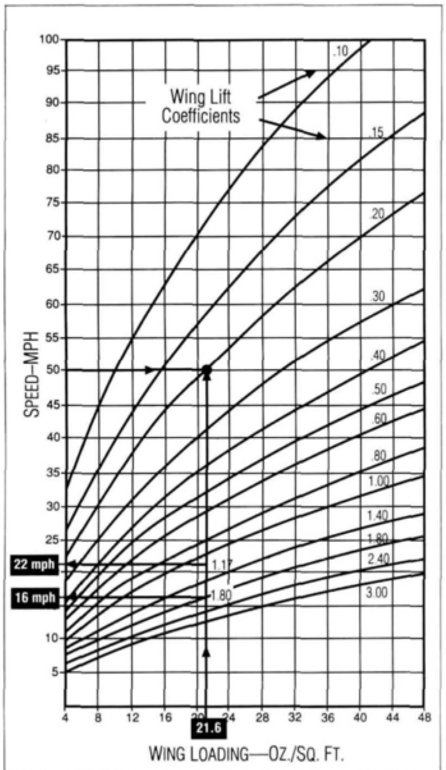


Figure 7. Nomograph for quick determination of wing loading, lift and speed at sea level.

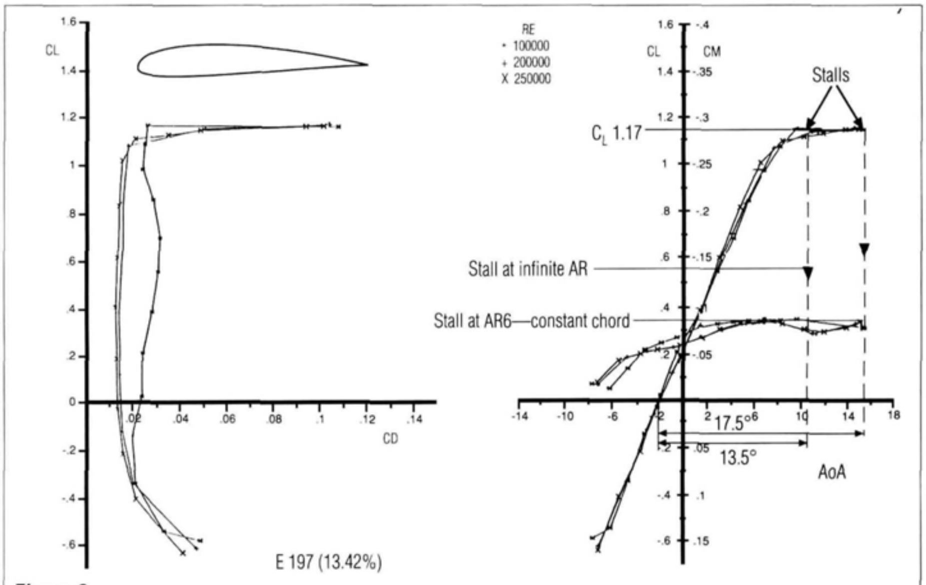


Figure 8.

of incidence to the fuselage center line on your drawings.

Note that a symmetrical airfoil's angle of zero lift is zero degrees AoA. If our wing used a symmetrical section, its AoA would be 2.5 degrees, as would its angle of incidence.

This is the "rigging" for a sport model using a cambered airfoil such as E197, i.e., 0.5 degree AoA. Most pattern ships use symmetrical wing and horizontal tail airfoils; such airfoils have no pitching moment and perform as well inverted as they do upright, but with lower maximum lift coefficients (C_L max) compared with cambered airfoil sections (reference 7).

These agile models have chords of both wing and tail airfoils set at zero degrees relative to their fuselage center lines. A symmetrical airfoil at zero degrees AoA will produce no lift.

What happens is that, to take off, the pilot commands up-elevator, thus adjusting the wing to a positive AoA, and it lifts. The lift produces downwash that strikes the horizontal tail at a negative (or downward) angle causing a down-load on the tail that maintains the wing at a positive, lifting AoA. In both upright and inverted flight, the fuselage is inclined nose up at a small angle and with some added drag.

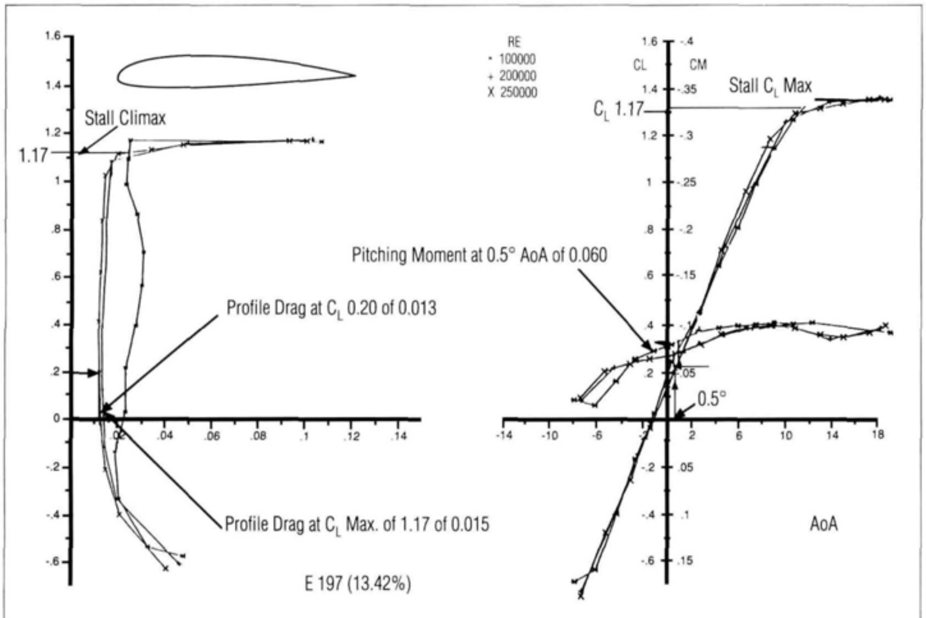


Figure 10

SOLUTION NO. 2

This method is more accurate and involves one of the "dreaded" formulas, as follows:

$$\text{Lift} = \frac{C_L \times \sigma \times V^2 \times S}{3519}$$

Because we want to obtain the lift coefficient needed, this formula is modified to:

$$C_L = \frac{\text{Lift} \times 3519}{\sigma \times V^2 \times S}$$

These symbols represent:

C_L = lift coefficient needed;
Lift = model's gross weight in ounces;
V^2 = estimated cruise speed in mph "squared";
S = wing area in square inches;
σ = density ratio of air:

- at sea level, it's 1.00;
- at 5,000 feet, it's 0.8616;
- at 10,000 feet, it's 0.7384.

A modeler living in Denver, CO, at 5,000 feet above sea level would use a σ of 0.8616.

For our model, at sea level, this would be C_L = (90 x 3519) divided by (1.00 x 50^2 x 600), or 0.211.

Our sample wing has a lift coefficient of 0.08 per degree. The wing's angle of attack would be 0.211 divided by 0.08, or 2.64 degrees, less the E197's 2-degree negative to zero lift, or 0.64 degree, rounded out to the nearest ¼ degree, or 0.75 degree.

FIGURE 7

This nomograph is one of the most useful charts in this author's "bag of tricks." It compares three important factors: speed (mph), wing loading (oz./sq. ft.) and wing lift coefficient (C_L). It reflects the impact of changes in these factors.

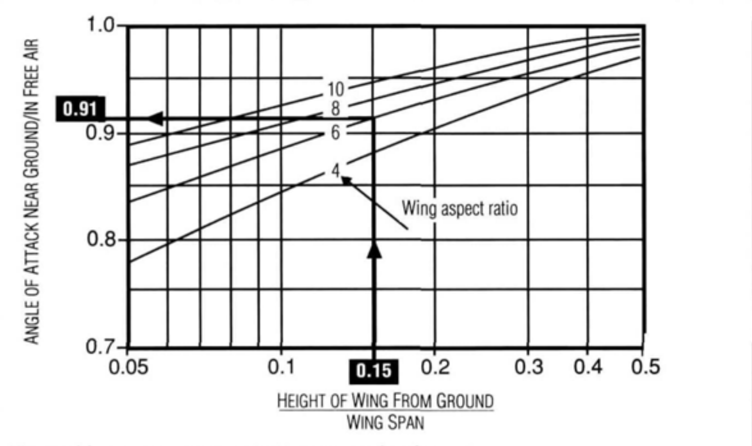


Figure 11. Impact of ground effect on angle of attack.

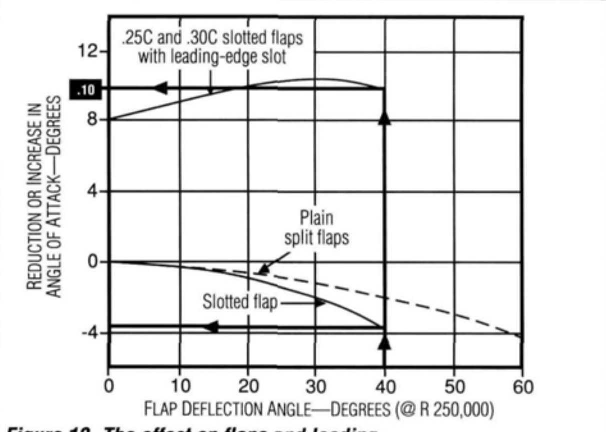


Figure 12. The effect on flaps and leading-edge slots on the angle at maximum lift.

For example, our paper design has a wing loading of 21.6 ounces per square foot of wing area; the wing has airfoil E197, which has a maximum lift coefficient (C_L max) of 1.17 (Figure 7). Using figure 7, its stall speed is 22mph. Adding 20 percent, its landing speed, under good control, would be 26.4mph.

Figure 7 is most useful in the early stages of a model's design. For example:

- **At constant speed,** it shows the effect of changes in wing loading, i.e., wing area and/or weight, on the lift coefficient needed for level flight. As wing loading increases, so must the lift coefficient.
- **At constant wing loading,** it displays the effect of the lift coefficient on speed (or vice versa). For illustration, if our sample model had slotted flaps that, when extended, increased the wing's CL max to 1.80, the stall speed would decrease to 16mph from the unflapped 22mph, or become 27 percent slower.
- **At constant lift coefficient,** changes in wing loading are reflected in the speed needed for level flight, and vice versa.

Figure 7 is versatile and useful.

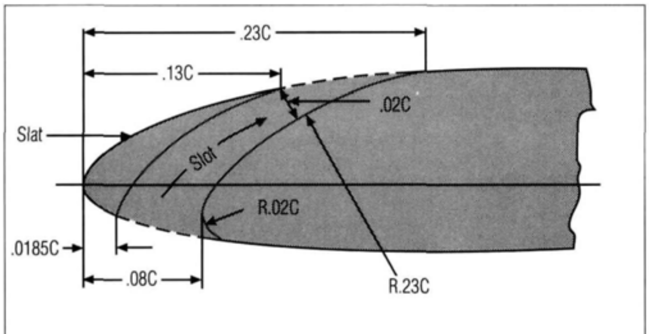


Figure 13. Geometry of the fixed leading-edge slot.

STALLING ANGLES

In Figure 8, at infinite aspect ratio, the E197 stalls very gently at about plus 11.5 degrees, or 13.5 degrees from zero lift. For our wing of AR6 and constant chord, this would be:

a = 13.5 + (18.24 x 1.17 x 1.17 divided by 6), or 17.5 degrees from zero lift, or 15.5 degrees AoA at altitude.

However, for landing, this stall angle is greatly modified by:

- **Ground effect,** as shown in Figure 11, at 0.15 of the wingspan (60 x 0.15, or 9 inches) above ground, the stall angle is reduced to 0.91 of its value at altitude, or to 14 degrees.
- **The level flight wing AoA.** Because the wing is at 0.5 degree, it will stall at 13.5 degrees higher AoA.
- **High-lift devices.** As Figure 12 shows, slotted flaps extended 40 degrees would cause a further reduction of 4 degrees to 9.5 degrees stall angle. Had the slotted slaps been combined with fixed leading-edge (LE) slots, there would be a gain of 9 degrees, to 22.5 degrees stall angle.

The model's landing stall angle has a major impact on landing-gear design. Reference 6 goes into detail (see figure 9).

Figure 13 shows the geometry of a fixed LE slot. Note how the slot tapers from the lower entry to the upper exit.

Figure 14 displays the benefits of an LE slot in added lift coefficient and additional effective angles of attack before the stall. Drag is little affected.

Figure 15 shows the additional lift coefficient to be obtained from various types of

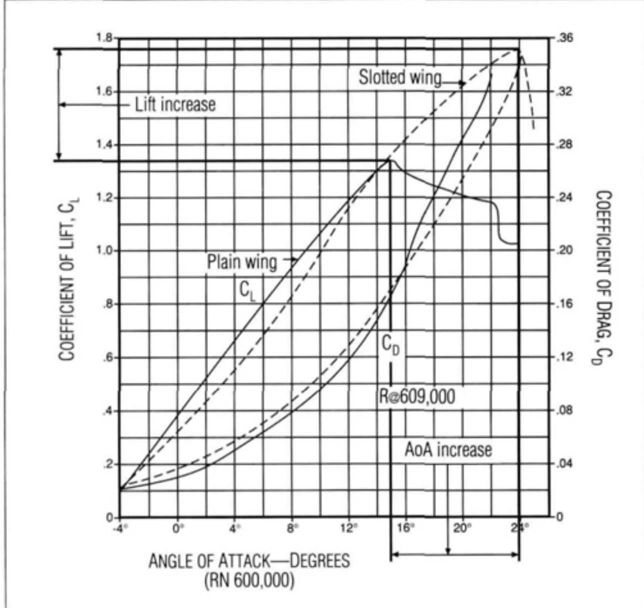


Figure 14. The benefits of the fixed leading-edge slot.

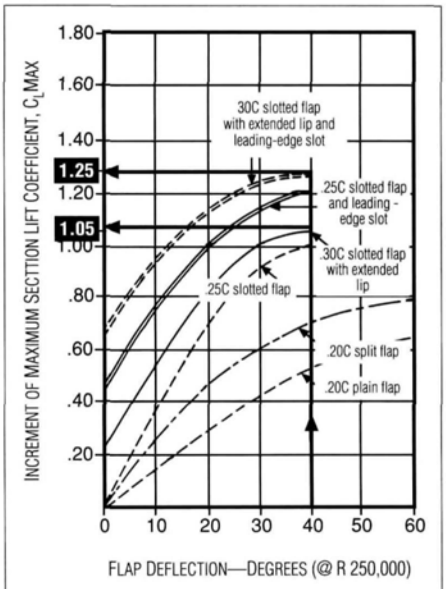


Figure 15. Increments of maximum lift due to flaps and leading-edge slots.

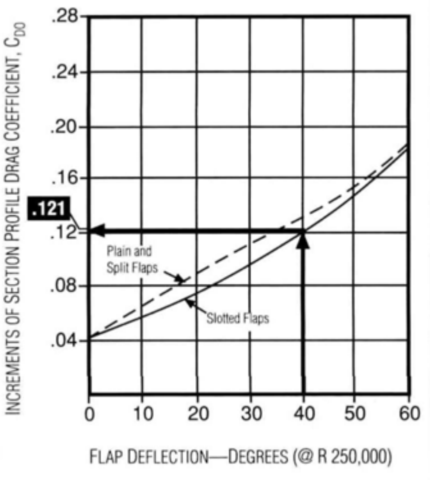


Figure 16. Increments of profile drag coefficients at C_L max or increasing flap deflection.

flap alone, or in combination with LE slots.

Slotted flaps and fixed LE slots combine to more than double the lift coefficient of most airfoil sections, producing STOL performance.

For example, our E197 C_L max is 1.17. Equipped with deployed 30-percent-chord slotted flaps with extended lip and LE slots, both full-span, the wing's C_L max would be 1.17 + 1.25, or 2.42.

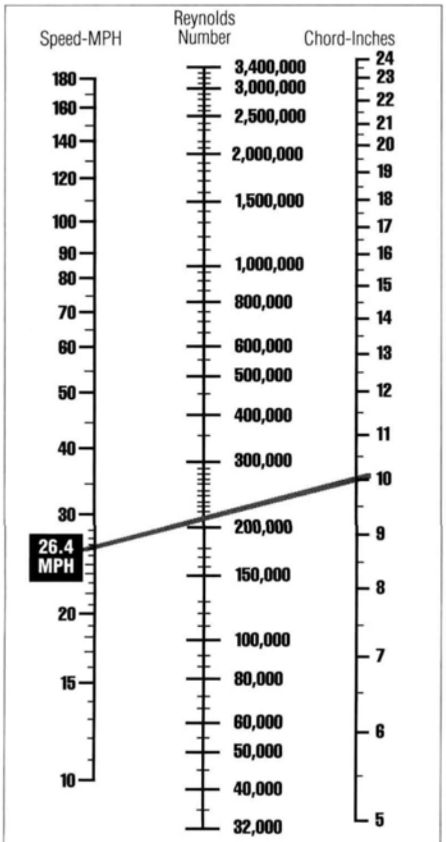


Figure 17. Nomograph for quick determination of Reynolds numbers

Our sample model so equipped would stall (Figure 7) at 14mph.

Figure 16 shows the added profile drag coefficient to be added to the section's (Figure 1) profile drag coefficient, when calculating the total of both profile and induced drags, discussed under "drag," as follows.

DRAG

The drag coefficients shown in Figures 10 and 16 are profile drag only. C_L max profile drag of the unflapped E197 is 0.015 (Figure 10) and for full-span slotted flaps would be an additional 0.121 (Figure 16), for a total of 0.136 in profile drag. Induced drag is not included. Note the very small increase in E197's profile drag for C_L 0.20 to C_L max 1.17.

The formula for calculation of total wing drag is:

$$C_D = C_{Do} + \frac{.318 \text{ x } C_L^{\,2}}{AR} \text{ x } (1 + \sigma)$$

Symbol definitions are:

C_D = total of both profile and induced drags;
C_{Do} = section profile drag coefficient at the chosen wing lift coefficient;
$C_L^{\,2}$ = wing-lift coefficient "squared";
AR = aspect ratio;
σ = planform drag adjustment factors (Figures 5 and 10).

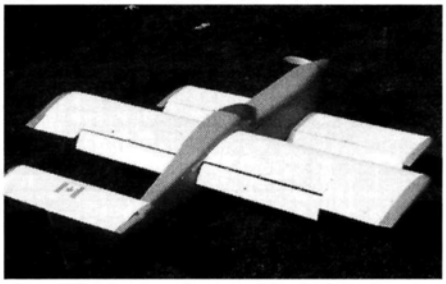
Our model's wing has a profile drag coefficient of 0.013 at C_L 0.20 (Figure 10) and a drag planform adjustment (Figure 5) of 0.05.

Replacing symbols with numbers for the plain wing:

$$C_D = 0.013 + \frac{.318 \text{ x } 0.2^2 \text{ x } 1.05}{6}$$

or 0.01523

If our sample wing had full-span slotted flaps extended 40 degrees and were 30 percent of the wing chord, the total drag coefficient, at a C_L max totaling (1.17 + 1.05), or 2.22 (Figure 15), would be:



The Wild Goose shown with slotted flaps on both front and main wings extended for slow, stable landings.

$$C_D = (.015 + .121) + \frac{.318 \text{ x } 2.22^2 \text{ x } 1.05}{6}$$

or 0.410

(Figures 10 and 16)

The formula for total wing drag is :

$$\text{Drag (ounces)} = \frac{C_D \text{ x } \sigma \text{ x } V^2 \text{ x } S}{3519}$$

Replacing the symbols with numbers for the plain wing at 50mph:

$$\text{Drag (ounces)} = \frac{0.01523 \text{ x } 1 \text{ x } 50^2 \text{ x } 600}{3519}$$

or 6.5 ounces.

And for the full-span, slotted-flap version at a stalling speed of 14mph, 30 percent chord flaps at 40 degrees:

$$\text{Drag (ounces)} = \frac{0.410 \text{ x } 1 \text{ x } 14^2 \text{ x } 600}{3519}$$

or 13.7 ounces.

Note in Figure 6, the lower drag correction factor σ for the tapered wing, of taper ratio 0.6, is 0.02 compared to that for a constant-chord wing of 0.05.

SCALE EFFECT

Scale effect is measured by Reynolds numbers. In E197, Figure 1, lift and pitching moments are little affected by the reduction in R_N (or R_E) from 250,000 to 100,000, but profile drag increases substantially.

The formula for Reynolds numbers is simple:

R_N = Speed (mph) x chord (inches) x K.

- K at sea level is 780;
- at 5,000 feet, it's 690;

Figure 9. **References to Articles in *Model Airplane News***

Issue	Reference no.	Title
October/November 1991	1	Design For Flaps
May/June 1992	2	Airfoil Selection
November/December 1992	3	Propeller Selection
January/February/March 1993	4	Wing Design
February 1994	5	Estimating Level Flight Speeds
March/June 1994	6	Landing Gear Design
January 1995	7	Understanding Airfoils
September 1995	8	Horizontal Incidence and Downwash Estimating

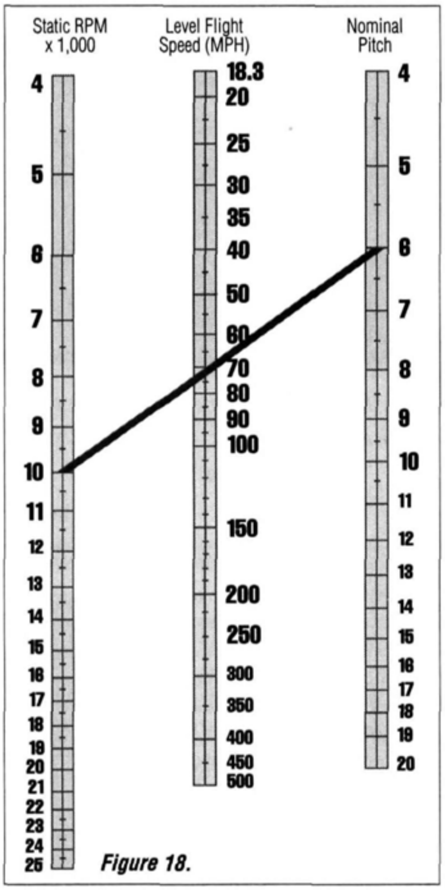


Figure 18.

• at 10,000 feet, it's 610.

Our sample model's wing chord is 10 inches, and at a landing speed of 26.4mph and at sea level, it's R_N would be 26.4 x 10 x 780, or 205,920.

In Denver, the R_N would be 26.4 x 10 x 690, or 182,160.

A quicker solution at sea level is given in Figure 17. Laying a straightedge from "speed" left to "chord" right, R_N is read from the center column.

Note that a tapered wing's root chord always flies at a higher R_N than its tip chord at any speed, owing to the narrower tips, which can be prone to tip-stalls as a result.

Full-scale airfoil research data may be used for model airplane wing design—with careful regard for the major effect of scale particularly on lift, drag and stall angles (references 2 and 7).

PITCHING MOMENTS

These have nothing to do with baseball! All cambered airfoils have nose-down, or negative, pitching moments. Symmetrical airfoils have no pitching moments, except at the stall. Reflexed airfoils may have low nose-down or low nose-up pitching moments (reference 7).

Nose-down pitching moments must be offset by a horizontal tail down-load that is achieved by having that tail's AoA set at a negative angle to the downwash from the wing. Reference 8 goes into detail.

As Figure 10 shows, the E197 airfoil has a negative pitching moment C_M of 0.060 at an AoA of 0.5 degree. Note that the pitching moment C_M, like the lift coefficient C_L, varies with the angle of attack.

Also, the pitching moment applies to the wing's ¼ mean aerodynamic chord; on our straight wing of 10 inches chord, at a point 2.5 inches from its leading edge.

The pitching moment formula is:

$$\text{PM in inch ounces} = \frac{C_M \times \sigma \times V^2 \times S \times C}{3519}$$

Symbol definitions are:
C_M = airfoil pitching-moment coefficient at the AoA of level flight;
V^2 = speed in level flight "squared";
S = wing area in square inches;
C = chord in inches;
σ = density ratio of air.

Our sample wing's nose-down PM is:

$$\text{PM} = \frac{.060 \times 1 \times 50^2 \times 600 \times 10}{3519}$$

or 255.75 inch-ounces

A moment is a force times a distance. In our sample, if a tail-moment-arm distance were 30 inches, the tail download to offset the nose-down moment would be 255.75 divided by 30, or 8.52 ounces.

Reference 8 goes into detail.

RPM, SPEED AND PITCH NOMOGRAM

This nomogram (Figure 18) was developed to help model designers choose prop pitches and diameters suitable for both plane and engine to obtain optimum performance.

This is explained in Reference 3: "Propeller Selection." Figure 18 should be used with Figure 7 "Wing Loading Lift Speed Nomograph." Don't use Figure 18 alone to estimate the speed of any prop/plane/engine combination; if the prop pitch and diameter aren't suitable for a model's characteristics, the nomogram will not be accurate.

It would obviously be poor judgment to use a high-pitch, low-diameter propeller on a large, slow flying, draggy model with low wing loading. Similarly, a low-pitch, large-diameter prop on a low-drag, fast airplane with high a wing loading would be a poor choice.

I hope that this article will overcome the problems some readers have had with past articles (and future "How To" articles). To succeed, one must try! No effort, no success. ■

CENTER ON LIFT

MICHAEL LACHOWSKI

REVIEWING THE LITCO ALPHA 4

OVER THE YEARS, I've collected a variety of chargers, cyclers and testers for batteries. Now I can clear off the shelf; I just use one device—the Litco* Alpha 4. It combines fast, normal and trickle-charging with battery cycling and a voltmeter. The "4" means you have four of these circuits all packaged in one box.

There was a time when everyone used 500mAh AA batteries for almost everything. A radio system included a simple charger that charged at 50mA—the C/10 (capacity divided by 10) overnight charge rate. Now I don't have a single 500mAh pack; most of my packs are now 700mAh. I have 110mAh batteries for hand-launch gliders, 600 and 700mAh batteries in various packages and some 1200mAh or larger batteries when I need some extra nose weight and have the space. Some of these packs use five cells instead of four to provide extra speed and power. How can I charge these different packs at home and fast-charge them at the field?

Each of the four battery-management circuits on the Alpha 4 can be programmed to charge from 1- to 12-cell battery packs with capacities from 10mAh all the way to 9999mAh. Several charging strategies are available, including options to drop to a trickle-charge rate once the battery reaches full charge. Both fast-charging and peak-detect fast-charging are available in the Alpha 4. A nice feature of the microprocessor circuitry and LCD display is that you can see the charging state of your battery. The microprocessor can also detect the wrong battery polarity and if the number of cells doesn't match the battery pack. It also detects batteries that have a bad cell because the voltage is too low.

The Litco Alpha 4 will cycle and charge your TX and RX batteries. It has a programmable capacity/charge rate to handle different size flight packs.

Programming is quick and simple with the 12-button keypad. Press the "P" key to start the program, followed by the port (1 to 4), and then select the type of charging you want. You have to enter the number of cells (01 through 12), and you might have to enter the battery capacity (0010 through 9999) for some of the charging methods. Remember, the charger can measure the voltage and determine whether you're going to cook your batteries with the wrong number of cells.

CYCLING ADVANTAGE

The Alpha 4 is also a great cycler. Old batteries lose capacity, and you need to test them and keep records to prevent any surprises while flying. Two cycling programs—fast and slow—are available with the Alpha 4, and it reads the capacity in mAh directly on the LCD display. Cycling is just like charging except you select the one of the two cycling programs instead of a charging program.

You can cycle one battery while charging others. The program versatility means the Alpha 4 can meet all your battery-charging needs for your flight packs and transmitters. It will even act as a voltmeter, and it can charge 12V batteries, too. Don't expect it to fast-charge electric-motor flight packs.

The Alpha 4 includes a few built-in program templates. These can handle normal charging, but I find the programming simple and quick so I always program the individual circuits. It would be nice if the Alpha 4 could save your programs, but the only way to do this is to keep a battery attached to the first charging circuit to preserve the programs when the power is disconnected.

Speaking of power for the charger, you can use an AC wall adapter or connect the charger to a 12V battery. This makes the Alpha 4 portable for field use. Just carry out the charger along with the clips for a 12V battery or lighter plug.

Have I found the ultimate battery-management system? Not yet, but the Alpha 4 does have all the functionality I need for batteries built into one box. It's a big step forward and takes much less space than a bunch of different, special-purpose chargers, cyclers and meters. While the price may seem high,

AT A GLANCE

Hits
- Programmable number of cells—great for 5-cell battery packs.
- Programmable capacity/charge rate to handle small hand-launch glider packs as well as large, high-capacity flight packs.
- Charge up to four packs at one time using only one charger.
- Works with AC adapter or from a 12V battery.
- Can be used as a cycler and to replace an ESV.

Misses
- Keypad can be difficult to use, and keystrokes are not entered.
- Leading 0's required for number of cells and most battery-capacity entries.
- Doesn't include plugs to make your own connectors.

I've spent much more on the other equipment, and I can't handle as many batteries as I can with the Alpha 4. Now if only it had a computer interface, could log some data and would remember my program without attaching a battery pack.

With the price of modern sailplanes and the wide variety of battery packs now being used, it's important to keep batteries in top shape. The Alpha 4 is a great device to ensure that your batteries are properly charged and are up to capacity. It might even save you some space and reduce the electronic equipment you need in the shop and at the field.

**Addresses are listed alphabetically in the Index of Manufacturers on page 135.* ■

MORE AIRFOIL DATA

I've been telling you about the low-speed, wind-tunnel testing by Michael Selig and his graduate students at the University of Illinois. The first set of tests is complete, and the data is now available in a book and on a disk. This work is titled "Summary of Low-Speed Airfoil Data, Volume 1." Similar to SoarTech No. 8 "Airfoils at Low Speeds," it contains 317 pages on the latest wind-tunnel test data and findings on airfoils related to model airplanes.

SoarTech will be handling the orders for the book. The book is $25, and the disk is $15 in the U.S. For international orders, add $4 for surface mail, or contact SoarTech for airmail costs. Proceeds will help support the continued testing at UIUC. For more information, contact SoarTech Publications, 1504 N. Horseshoe Cir., Virginia Beach, VA 23451, or HERKSTOK@aol.com on the Internet. Continued support of this testing program through donations and other means will provide the funding for additional volumes of data.

CLASSIFIEDS

RATES: non-commercial—25 cents per word (no commercial ads of any kind accepted at this rate); commercial— 50 cents per word (applies to retailers, manufacturers, etc.); count all initials, numbers, name and address, city, state, zip code and phone number. **All ads must be paid for in advance.** To run your ad for more than one month, multiply your payment by the number of months you want it to run. Deadline: the 10th day of the month, 3 months in advance, e.g., *January 10 for the April issue.* We don't furnish box numbers, and it isn't our policy to send tear sheets. **SEND AD AND PAYMENT TO: Elise Silkowski, CLASSIFIED ADS, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897-3035, or call (203) 834-2339.**

R/C WORLD ORLANDO, FL, CONDO RENTAL: 2 bedroom, furnished. Available weekly or monthly. Low rates. 100-acre flying field with enclosed hangars. Close to Disney World and Epcot Center. For information, please call or write to R/C World, 1302 Stearman Ct., Orlando, FL 32825; (407) 380-6359.

ENGINES: IGNITION, GLOW, DIESEL—new, used, collectors, runners. Sell, trade, buy. Send $3 for huge list to Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555; (619) 375-5537 [11/95]

FLY DAVE BROWN SIMULATOR. Use your transmitter. Works with Futaba, JR, Airtronics, Hitec. Uses Standard joystick connection. For more info, contact Computer Designs, 8530 N. Montana Ave., Helena, MT 59601;(406) 458-9416. [1/96]

SODA-CAN AIRPLANES—replica biplane detail plans with photos $7.50 PPD, Early's Craft, 15069 Valley Blvd. SP 26, Fontana, CA 92335. [8/96]

CARS. Selling model collection, 1973 issues up, 1/24-1/25, individual prices, about 800. Ralph, Box 2423-P, Yakima, WA; (509) 965-0670 [11/95]

WANTED: Model engines and racecars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [10/95]

MAGAZINE BACK ISSUES—*American Modeler, American Aircraft Modeler, Aeromodeller, Model Airplane News, Model Aircraft, RCM* and more; 1930s–1990s. For list, send SASE to Carolyn Gierke, 1276 Ransom Rd., Lancaster, NY 14086. [3/96]

WANTED: ignition model engines 1930s to 1950s, especially Elf, Baby Cyclone, Brown Jr., Ohlsson Custom and Gold Seal. Also model racecars, any parts, spark plugs, etc; Woody Bartelt, 1301 W. Lafayette St., Sturgis, MI 49091; (616) 665-9693, or (800) 982-5464. [10/95]

CASH FOR ENGINES: ignition, glow, diesel–all types; any condition; sale list, too! Estates my specialty! Send SASE for list. Bob Boumstein, 10970 Marcy Plaza, Omaha, NE 68154; (402) 334-0122. [11/95]

R/C SKYDIVNG-It's fun. It's different. It's a gravity-powered adventure! New, lower prices, new parachutes, *free* jump plane plans, etc., etc. Latest catalogue $1.00. R/C Skydivers, Box 662B, St. Croix Falls, WI 54024. [12/95]

WANTED: Model engines and racecars before 1956. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [12/95]

REPLICA SWISS WATCHES—18KT goldplated! Lowest prices! Two-year warranty! Waterproof! SubmDivers, DaytChronos, others! Phone (404) 682-0609; Fax (404) 682-1710.

WANTED: Old, unbuilt, plastic model kits from '50s and '60s. Send list, price to Models, Box 863, Wyandette, MI 48192. [2/97]

NEW ZEALAND AERO PRODUCTS—Scale plans: Pawnee Brave, Pawnee, Airtruk/Skyfarmer, Agwagon, Fletcher FU-24, Cessna Aerobat, DC-3/C-47, Typhoon, Hall's Springfield Bulldog, Fairchild PT-19/Fleet PT-26, Rearwin Sportster and more. Fiberglass parts, hardware paks, color photo paks available. Free documentation with plans. Catalogue/price list: $5 (U.S.); Visa/MC. 34 Ward Parade, Stirling Point, Bluff, New Zealand. Phone/24 hr. fax—0064-03-212-8192. [2/96]

ENGINES, KITS & ACCESSORIES: 35-year collection for sale. For listing send #10 SSAE to: Ed Hagerlin, Box 1980, Overton, NV 89040. [2/96]

SCALE AIRCRAFT DOCUMENTATION and Resource Guide. Larger, updated 1995 edition. World's largest commercial collection. Over 5,500 different color FOTO-PAAKS and 30,000 three-view line drawings. 168-page resource guide/catalogue $8.00; Canada—$9.00; foreign—$14.00. Bob Banka's Scale Model Research, 3114 Yukon Ave., Costa Mesa, CA 92626; (714) 979-8058. [2/96]

AERO FX BY JO DESIGNS—exact-scale, computer-cut, high-performance vinyl graphics and paint masks. Lettering; nose art; insignia for scale; pattern, pylon and sport fliers; complete graphic sets available. Call or write for free sample and catalogue. JO Designs, Rt. 1, Box 225 AA, Stratford, OK 74872; (405) 759-3333; fax (405) 759-3340. [11/95]

BOB FIORENZE BUILDING SERVICE. Jets, warbirds and helicopters. Contact Bob at (407) 330-1448. Our experience is your best assurance. [12/95]

MODEL AIRPLANE NEWS, 1930-1980; "Air Trails," 1935-1952; "Young Men," 1952-1956; "American Modeler," 1957-1967; "American Aircraft Modeler," 1968-1975. $1 for list. George Reith, 3597 Arbutus Dr. N., Cobble Hill, B.C. Canada V0R 1L1. [2/96]

ANTIQUE IGNITION engine parts: excellent reproductions, fuel tanks, points, timers, coils, needle valves, gaskets, etc. Champion spark plugs. Catalogue—$5 (intl. airmail—$7). Aero-Electric, 1301 W. Lafayette St., Sturgis, MI 49091. [10/95]

GIANT-SCALE PLANS by Hostetler. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667.[12/95]

PLANS ACCURATELY ENLARGED or copied. Any scale, any size. Money-back guarantee. Send $2 for info and a customized poster for your shop. Roland Friestad, 2211M 155th St., Cameron, IL 61423. [12/95]

SOARING VIDEO: 50 minutes of basic R/C glider technique taken from "Old Buzzard's Soaring Book." Video $27.95, book $16.95, both $39.95 postpaid. Dave Thornburg, 5 Monticello, Albuquerque, NM 87123; (505) 299-8749. [12/95]

HISTORIC REPLICAS: DISCOUNTS! Flying Tigers, 94th Aero, Lafayette Escadrille accessories, Air Forces Bullion Patches, pilot sport shirts, T-shirts, wings, medals, beer steins, scarves, WW I squadron pins from $4.95. Free gift with order. Catalogue $1, refundable. Company of Eagles, 875A Island Dr., Ste. 322N, Alameda, CA 94502. [12/95]

SCALE PLANS AND PHOTO SERVICE: Four scale catalogues; SPPS 163 Superscale Plans, SPPS Documentation Photos, 3-views, Argus Scale Plans Handbook, Argus 3-view Scale Drawings. The Best! $5 each USA and Canada. $10 each overseas Air. SASE for enlarging prices. Jim Pepino's Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; phone/fax (910) 292-5239. Visa, Mastercard. [12/95]

HELICOPTER SCHOOL. Five days of hands-on instructions with X-Cell helicopters and Futaba and JR computer radios. Small classes, tailored to your individual needs, beginners to expert. Includes all meals and lodging. Over 420 students from 23 countries and 44 states, logging 14,500 flights in the last five years. Located on a 67-acre airport used exclusively for R/C training. Owned and operated by Ernie Huber, five-time National Helicopter Champion. Send for free information and class schedule now! P.O. Box 727, Crescent City, FL 32112; phone (800) 452-1677; fax (904) 698-4724. Outside U.S., phone (904) 698-4275. [12/95]

PLANS ENLARGING. Old model magazines, scanning, plotting, model software. Free information. Concept, P.O. Box 669A, Poway, CA 92074-0669; (619) 486-2464. [11/95]

FOR SALE—OPS B-20 twin marine—very rare. Approximately 113 built by Picco. See 11/76 *Model Airplane News* for engine review and specs. Never-run twin tuned pipes and custom cedar box included. Chuck (eves)—(408) 659-5138. [10/95]

FLAPERONS, elevons, vee-tails, wings, dual throttles, need the MicroMixer. Tiny 1/3 ounce. Airborne computer mixing for standard radios! Without connectors, $29 assembled, $21 kit; $2.25 shipping. Quillen Engineering, 561 N. 750 W., Hobart, IN 46342; (219) 759-5298. [10/95]

GIANT-SCALE KITS: From Jim Meister Plans. P-51, Spitfire full wood kits. 109, Corsair, 190, P-47 semi-kits. Squint scale 81", P-40B from Tim Farrell Flight Plans. Custom cutting also available. Send SASE to Starlight Hobbies, P.O. Box 626, Stone Ridge, NY 12484-0626, or call (914) 687-4737 between 6-10 pm. [10/95]

GEE BEE plans (Benjamin used). Twelve airplanes, 1/3, smaller. Shirts! Catalog/News $4. Vern, 308 Palo Alto, Caldwell, ID 83605; (208) 459-7608. [10/95]

GERMAN AIRCRAFT WW II—handbooks, service-parts lists, instruction manuals. List for $2. Udo E. Hafner, Konigsallee 69, D-71638 Ludwigsburg, Germany. [2/96]

MAKE REAL DECALS with your computer and printer. Send $10 for introductory kit to: LABCO, Dept. MAN 27563 Dover, Warren, MI 48093. [2/96]

COLLECTION FOR SALE: Over 350 kits from 40's, 50's, 60's, F/F, R/C, U/C, Rubber, Solids, Jetex. Send SASE ($.55) to Dr. Frank Iacobellis, 62 Palisade Rd., Rye, NY 10580, or call (914) 967-5550. [1/96]

SOUTHWEST MODEL BUILDER. Full-line builder will build your aircraft from trainer to ducted fan, completely finished or ready to cover. Reasonable rates, satisfaction guaranteed. Call after 9 a.m.; (505) 891-4241. [10/95]

MODELMAKERS, COLLECTORS: Aviation packets for sale. Plans, 3-views, cutaways, drawings, engines, racing A/C, etc. $5 to $16. Send $1 and SASE for info. Doug Worthy, 1149 Pine, Manhattan Beach, CA 90266. [1/96]

ULTRALIGHT AIRCRAFT. One year old April '95, and our monthly publication is still growing. You can learn to fly the real thing. Buy, sell, trade, kit built, fixed wing, powered parachutes, rotor, sailplanes, trikes, balloons and more. Stories galore! Sample issue $3. Annual subscription $36. Introductory offer of only $24. Ultraflight Magazine, 12545 70th Street, Largo, FL 34643-3025; (813) 539-0814. [10/95]

ULTRASMOKE! Better than any other smoke oil! Will not harm paint, covering or foam. Creates brilliant white billowing smoke. $42.75 for four gallons including freight. Send check to ULTRA-SMOKE, 11600 Kent, Wichita, KS 67209; (316) 721-3864. [11/95]

PLANS - R/C sailplanes, scale, sport and electric. Old timer, nostalgia and FF scale and sport-powered, rubber and towline. All models illustrated. Catalogue $2. Cirrus Aviation, P.O. Box 7093, Depot 4, Victoria, BC V9B 4Z2 Canada. [11/95]

R/C WORLD ORLANDO—CONDO SALE - 2 bedroom, furnished on a 100-acre flying field with enclosed hangars. Close to Disney World and Epcot Center. For additional info, please call or write: R/C World, 1302 Stearman Ct., Orlando, FL 32825; (407) 380-6359.

BYRON F-15, O.S. 91s, Futaba Super 7 radio, incredible finish—$3,000; Byron P-51, Q-40 gear reduction, Futaba 7UAP radio, retracts, ready for paint—$2,000; BVM F-16, BVM-91, Futaba 7UAP radio, all options, with gyro, never flown, General Dynamics paint scheme—$3,200; BVM Viper, BVM-82, retracts, Futaba 7UAP radio, ready for paint—$2,200. Call Rick at (203) 748-2799 days; (914) 667-9360 evenings. [10/95]

WANTED: 1950's Piper Tri-Pacer gas-powered control-line model by Comet; (610) 458-5796. [11/95]

WANTED: Old gas-powered model racecars with or without engines. Richard Gronowski, 140 N. Garfield Ave., Traverse City, MI 49686; (616) 941-2111. [10/95]

VINCE MILLERS' DESIGNS—super deluxe scale plans for the Piper Tri-Pacer PA 22, Piper Super Cruiser; 1/4 scale—$29.95; 1/5 scale—$24.95; 1/6 scale— $19.95; 1/8 scale— $9.95. Add $5 rolled and postage. **Wanted**: ignition and 4-cycle engines and parts. Cash or trade. Send SSAE plus $1 for Bargain Sales catalogue to: Carl V. Miller, 1773 Blueberry Dr. N.E., Rio Rancho, NM 87124; (505) 891-1298. [10/95]

ANTIQUE IGNITION-GLOW PARTS CATALOGUE, 1/2 inch thick, timers, needle valves, cylinder heads, pistons, points, tanks, spark plugs, racecar parts, engines 1/2As, Baby Cyclones, McCoys, Phantoms, etc., $10 postpaid. (U.S.), $20 foreign. Chris Rossbach, R.D. 1, Queensboro Manor, Box 390, Gloversville, NY 12078. [2/95]

AVIATION HISTORY CATALOGUES: old, used, rare and out-of-print books on aviation, WW I, WW II, Korea, etc. To order catalogue, send $1 to: Q.M. Dabney & Co., Inc., Box 42026-AA, Washington, DC 20015. [2/96]

WANTED: WEBRA 90 ENGINE with factory cast aluminum gear reduction with hectical cut gears. Durbo belt drive gear reductions. After 5pm: (901) 373-3950. [10/95]

DUMMY ROUNDS! .50 caliber BMG, $5 each, 20MM cannon, $10 each, 30MM Cannon, $15 each, or all 3, $27 includes shipping. Check or money order to, G. Young Enterprises, 6336 North Oracle Rd., #326-108B, Tucson, AZ 85704. No orders outside U.S.[11/95]

DEBOLT PLANS: radio control; free flight; control line. Separate SASE for each list to: Fran Ptaszkiewicz, 23 Marlee Dr., Tonawanda, NY 14150-4321 [3/96]

USED MOTORS: O.S. 40 SF—$90, Fox 19 R/C—$20, SuperTigre 2500 with muffler and spinner—$200, and SuperTigre 40—$40. **New motors:** O.S. FP 60—$100. **Kits new in the box:** Hobbico: Viper RTC—$75. Skyward: Sporty 40 ARF—$145. Midwest Kits: Malibu Trainer—$60. Zero .40—$75. Thundertiger: Champion 45L—$125. Dynaflite: Corsair .40—$65. U.S. Air Core: Colt—$60. Lanier RC: Fun Fly 40S—$42. U.S. Air Core Colt—$60. Lanier RC: Fun Fly 40S—$42. **Small planes:** Sterling Lancer .60-size, flys great, no motor or radio—$175. Thundertiger Sport Flyer 40L, new, never flown—$150. RCM scratch-built forward swept wing with K&B 45, flys awesome, looks great—$175. Tidewater Windjammer with Fox 40 BB, low wing, nice flier, used—$175. E/Z Super Decatholon with Magnum Pro 61, like new with Airtronics FM radio, unreal vertical and snaps, beautiful—$400. Hi-G Turbo Tube twin with Magnum 46 SE's, Airtronics FM radio, flaps, flys very fast, lots of fun, new—$550. Dirty Birdi pattern plane with retracts, set up for O.S. .46, has tuned pipe, very pretty—$225. Holy Smoke Delta Wing with O.S. 46 BB tuned pipe, Airtronics FM radio, flys very very fast, unreal—$325. Ace 40-size Seamaster 45 Magnum Pro, used, fun on snow, too—$150. Goldberg Skylark low wing 56, new, never flown, beautiful—$175. Pica Duelist twin, very pretty, super flier, 40 to 45 size, no radio, no motor—$250. Great Planes Ultra Sport 40 size, no motor, no radio, very sharp—$135. Great Planes Super Sportster, 40 size, no motor, no radio, very nice, navy scheme, $125. **PLANES—LARGE SCALE:** Bud Nosen Gere Sport with Kraft radio, 21st fabric, orange, beautiful, 96" wingspan, flys super—$575. Skyward 120 trainer, 9' wingspan, with SuperTigre 2000 engine, Airtronics radio, looks and flys super—$850. R&K Models built big Super Chipmunk, 80" wingspan, with 3.2 Sachs, extremely detailed, JR radio, B&B smoke, show quality—$1800. Byron AT-6 deluxe kit complete NIB with Robart retracts and pneumatic kit—$850. Lanier Stinger 120, 80" wingspan with ST 3000, Airtronics radio FM with BB servos, flys super—$875. Cosmic Wind Racer, 42% Horndog racing, 96" wingspan, set up for 3-W Twin 4.2, no radio, very sharp and fast—$1800. Precision Built ⅓-scale Laser 200 with Walker 3.2 B&B smoke, all Futaba servos, 96" wingspan, super nice flier, very light and sharp—$1850. Byron Gee Bee, new, never flown, show quality with dummy radial, 80" wingspan with Purrr Power for G-62—$1800. A&A Big Citabria 106" wingspan, no motor, no radio, set up for ST 3000—$475. Balsa USA ⅓-scale Stearman, show quality with smoke, with 5.8 Sachs with Futaba servos, unreal detail—$4500. Balsa USA ⅓-scale Cub, 12' wingspan, with ST 4500 motor, very pretty, flys great—$2800. Scratch-built Ryan STA with Q35 motor, 90" wingspan, very pretty plane, has beeen flown—$550. Pica ⅕-scale Spitfire, 88" wingspan, show quality, never flown, no motor, no radio, Spring Air Retracts—$750. Lance P-40 Reno style with 3.2 Sachs, all new, never flown, very sharp—$1100. Morrisey Bravo 86" wingspan, custom built, no motor, no radio, very sharp, new, never flown, red/white, very light, 12½ lbs.—$725. Goldberg-style Sukhoi, no motor, no radio, super flier, 108 to 120 size, 73" wingspan, 8¾ lbs.—$475. Desert Aircraft DC-3 with O.S. FS .70 with Airtronics radio, on board glow, retracts, flaps, commercial airlines, new, never flown, complete, ready to fly, show quality—$6800. ¼-Scale Laser, remax style, very light 6½ lbs., no motor, no radio, flys unreal, 108 to 120 size, super clean, 74" wingspan—$475. Byron Sukhoi 27%, no motor, no radio, red & white scale paint, very sharp—$1200. Bradford ⅓-scale Laser 200, 98" wingspan, with new Brison 4.2, very sharp, excellent flier, all ball bearing servos, Futaba—$2200. **Jerry Juenemann, 383 Mopar Dr., Hays, KS 67601; (913) 628-6477 anytime.** Can ship anywhere. [10/95]

VACUUM FORMING - Your one-stop source for books, plastic sheets, components and ready-to-use machines in three sizes. New for '95, Hobby Vac System 2 machines. Free catalogue—(800) 391-2974; Vacuum Form, 272B Morganhill Dr., Lake Orion, MI 48360. [12/95]

SALE—Engines, kits, radios, accessories, 35-year accumulation. Johnsons, Veco, Torpedo, Rossi, etc., Speed, Carrier and Sport. Also late 4 cycles. For list, send #10 SSAE to E. Wielms, #E4, 1810 Gulfshore Blvd. N., Naples, FL 33940-4967; (941) 261-8498. [10/95]

ENGINES FOR LESS: New and used save big money! O.S., Supertigre, Fox, Enya, K&B, McCoy, Saito & more! All used engines come with **lifetime tradeback guarantee!** Consignment sales, Trade-in's too! Send legal-size S.A.S.E. or postage to get free list to: HWC, P.O. Box 94, Boystown NE 68154. [11/95]

WANTED: Midwest A-4. NIB preferred. Curtis at (212) 673-3614. [10/95]

PLANS: Flying Flea —original construction drawings and workshop manual (full size) $35. Bimonthly newsletter $15 ($18 Canada; $25 foreign). Archive, Box 892, Wooster, OH 44691. [10/95]

PAYING $50 TO $125 each for following toy metal outboard boat motors: Gale, Oliver, Sea Fury, single and twin Johnson, Mercury, etc. Also want thimble drone metal racecars. Gronowski, 140 N. Garfield Ave., Traverse City, MI 49686; (616) 941-2111. [11/95]

FOR SALE: Byron Originals Pipe Dream with extra wing and stab kit—$170, or with NIB O.S. Max 1.08 engine—$350. B&P Associates Perfection kit—$75. Miss Martha kit—$50. Wolff Pak Shrike kit—$30. Air Flair Schtick kit—$55. Robert Gordon, 101 Crofts Corner, Peachtree City, GA 30264 (404) 631-4220. [10/95]

TV SHOW. The producers at Telstar Video Productions, Inc., are proud to present the nation's only weekly half-hour TV show dedicated to model aviation. "REMOTE CONTROL" television can be seen on Satellite Galaxy 4, channel 15 or on cable: The Outdoor Channel. Call (800) 972-4847, or fax (407) 220-4849 for affiliate list or more information. Note to manufacturers: 30- or 60-second commercial spots are available. Advertise your products on national TV to millions of potential customers! [12/95]

PLANS: Old-time and vintage plans including rare Australian and European models. Send U.S. $5 to Aircraft Artwork, P.O. Box 304, Kilmore 3764, Australia, or fax +61-57-821683 for comprehensive catalogue/plans list. Visa/Mastercard welcome. [12/95]

CHINO AIR SHOW VIDEO. The golden years of "Planes of Fame" air shows 1984 to the last show in 1989. Two-hour VHS from original tapes. Check or M/O for $19.95 to: Howard Wilson, Box 4409, Oceanside, CA 92052. [12/95]

FOR SALE: Fox Buzzard 12-foot glider kit. Seems complete and buildable—$150 plus $20 postage. Old English model magazines '40s - '70s. SASE for list. Balsam, 4 Pickwick Hill Dr., Huntington Station, NY 11746; (516) 271-3267. [10/95]

MODEL MOTORS WANTED: most types, 1970 and earlier. Cash or trade. T. Crouss, 100 Smyrna, West Springfield, MA 01089. [12/95]

DETHERMALIZING CERTAINTY. For most free-flight models. Weighs .7 - 1.2 grams. large SASE to Wheels & Wings, P.O. Box 762, Lafayette, CA 94549-0762. [3/96]

R/C PARADISE. 37 acres riverfront, east central Idaho. 400x60-foot turf runway, 20x40-foot hangar/shop, 2,500 sq. ft. log home with outbuildings. Shirley Stroud, 525 Main St., Salmon, ID 83467; (208) 756-2524. [10/95]

PLANS TO BUILD—more than 700 tools, machines and accessories for your shop. Catalogue—$1. Wood-Met, Dept. MAN, 3314 W. Shoff Cir., Peoria, IL 61604-5964. [9/96]

WANTED: Futaba single stick helicopter transmitter or complete system. Robert Vomero (814) 825-8404. [11/95]

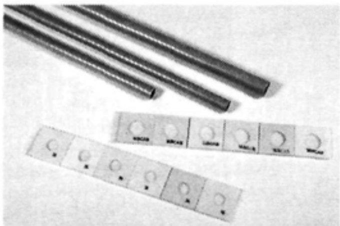
PRODUCT NEWS

HITEC/RCD
Prism 7 Spectra

The user-friendly programming and three-module memory of Hitec's Prism 7 radio have been enhanced with the new Spectra synthesized module, which allows you to change transmitter frequencies quickly and safely. It operates in both PPM and PCM modes. The entire package includes the Prism 7 radio, the Spectra synthesized module, four HS-422 servos, an RCD Supreme receiver, full Ni-Cds and a charger. The Spectra module can also be purchased separately.

Part nos.—HRS5200 (package); RCD4400 (Spectra module); **prices**—$489.95; $199.95.

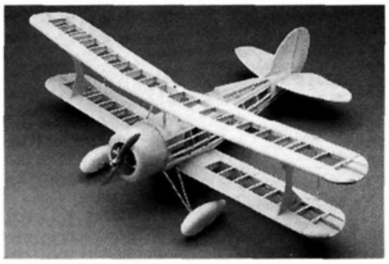
Hitec/RCD, 10729 Wheatlands Ave., Ste. C, Santee, CA 92071-2883; orders (800) 669-4672, (619) 258-4940; fax (619) 449-1002.



THE AEROPLANE WORKS
Wing Tubes

These 3-foot-long cardboard wing tubes are available in ½- and ¾-inch diameters. Each package comes with lite-ply supports and four tubes. They're perfect for routing servo wires through your model's wing.

The Aeroplane Works, 2134 Gilbride Rd., Martinsville, NJ 08836; (908) 356-8557.



MODEL TECH
Great Lakes Biplane

This built-up, hand-crafted plane has been hand-sanded and is ready for final assembly and covering. The wings have been joined at the factory, and shaped aluminum cabane struts and plywood interplane struts are ready to be screwed on. The model has a fiberglass cowl and plastic wheel pants and comes with hardware and photo-illustrated instructions. Specifications: length—34 inches; wingspan—47 inches (top), 43 inches (bottom); wing area—585 square inches; engine recommended—.40 to .53 2-stroke; radio required—4-channel.

Kit no.—123685; **price**—$215.95.

Model Tech; distributed by Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728-8610; (714) 963-0133; fax (714) 962-6452.

RHINO INTL. TOOLS LTD.
Miniature Woodworking Tools

This new line of miniature woodworking tools has been designed specifically for use in intricate, small applications. The tools are made of top-quality material, including lacquered hardwoods and brass fittings. Prices and information on specific tools can be obtained from Rhino Intl.

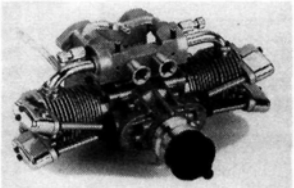
Rhino Intl. Tools Ltd., 22 Marina Rd., Leicester LE5 5NG, England; phone 011 44 116 273 9446; fax 011 44 116 276 9646.

DIRECT CONNECTION R/C
F/A-18 Hornet

Designed by Dennis Caudill, this prop-driven sport model has an all-balsa fuselage and built-up wings. The kit features internal linkages, pushrods and control horns, and computer-drawn, full-size plans ensure a precise parts fit. The wing design allows the model to slow down for realistic nose-high landings. Included are an illustrated instruction manual and a hardware package. This kit is not recommended for beginners. Specifications: length—59 inches; wingspan—53 inches; wing area—642 square inches; weight—7.5 to 8.5 pounds; engine required—.60 to .91; radio required—4- to 6-channel with at least five servos.

Price—$129.99.

Direct Connection R/C; distributed by Capstone R/C Suppliers, 562 W. Shrock Rd., Westerville, OH 43081; orders (800) 593-5250.



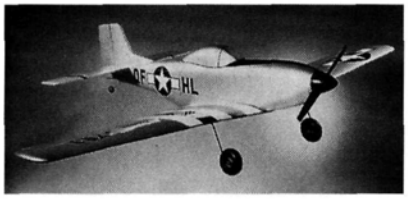
SAITO
182TD Twin 4-Stroke

Based on two of Saito's highly acclaimed 91S engines, the 182TD bridges the gap between Saito's 130T and 300T. To ensure a perfect mixture setting for each cylinder, it has dual carburetors and dual plugs, and it includes an integral motor mount. The 45-ounce engine can swing a 15x8 APC prop at 10,000 to 10,200rpm and a 15x10 APC prop at 9,000 to 9,2000rpm. Featuring true AAC construction, it has a bore of 28.2mm and a stroke of 24.0mm.

Part no.—SAIE182TD; **price**—$999.95.

Saito; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd, Champaign, IL 61821; (217) 355-9511.

PRODUCT NEWS



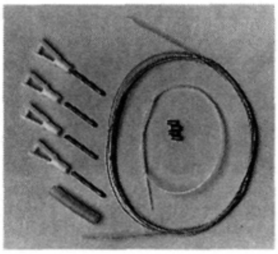
HOBBY LOBBY INTL.

P-51 Electric

This semi-scale model can taxi, take off and perform sharp aerobatics with its large, direct-drive motors. It comes with sheet balsa, a fiberglass fuselage, foam-core wings and landing gear. Specifications: length—41 inches; wingspan—60 inches; wing area—576 square inches; weight—89 ounces (with Speed 700 motor and 12 cells), 96 ounces (with Mega R5 or R7 and 16 cells).

Part no.—HSEA003; **price**—$169.

Hobby Lobby Intl., 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444; fax (615) 377-6948.



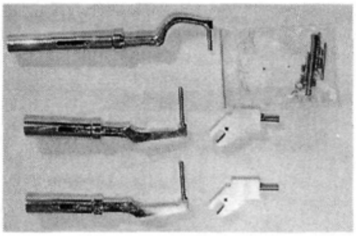
W.L. GORE & ASSOCIATES INC.

Hyperformance® Aircraft Cables

Manufactured with Teflon®, this low-friction cable system ensures smoother, easier and more precise activation and never requires lubrication. The system features a Teflon®-coated inner wire that slides inside a low-friction exit guide to eliminate large exit holes in the fuselage. During efficiency testing with simulated flight conditions, Hyperformance® cables showed few signs of wear and tear in 1,000,000 actuation cycles. Each set contains one length of cable, an exit guide and hardware, and each comes with a 1-year warranty against cable defect.

Prices—$29.95/rudder set; $36.95/elevator and aileron set; $14.95/throttle.

W.L. Gore & Associates Inc., 1505 N. Fourth St., Flagstaff, AZ 86003-3000; (800) 841-5668; fax (520) 527-0584.



AEROLOFT DESIGNS

Sport-Scale Struts

Designed for use with your favorite retract mechanism, these bar-stock aluminum struts will enhance the appearance of 15- to 20-pound models. They come with mounting hardware that includes retro-fit blocks for the Spring-Air mechanisms. The nose leg is 6¾ inches long; the main legs are 5½ inches long. For more information and a catalogue, send $3 to Aeroloft.

Aeroloft Designs, 130 W. Hampton, Ste. 20, Mesa, AZ 85210.

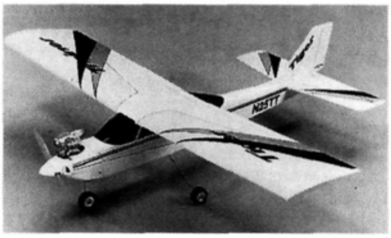
GREAT PLANES

PT-60 Trainer

This good-looking kit features interlocking I-beam construction for easier assembly and increased strength and CAD engineering for a precise parts fit. A high degree of washout has been built into each wing for added stability and to maintain lift at low speeds. Almost all of the PT-60 exterior is built of balsa, making it easy to sand and finish. The kit comes with photo-illustrated instructions and a hardware package that includes landing gear. Specifications: wingspan—71 inches; weight—7 to 8 pounds; length—53¼ inches; wing area—888 square inches; wing loading—18 to 21 ounces per square foot; engine required—.45 to .60 2-stroke or .48 to .70 4-stroke; radio required—4-channel.

Part no.—GPMA0119; **price**—$129.99.

Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104.



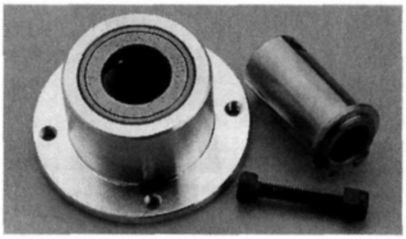
THUNDER TIGER USA

Tiger Trainer 25

Built and covered in a yellow, silver, blue and white trim scheme, the Tiger Trainer 25 only requires final assembly and radio and engine installation. The model is easy to transport and can be flown from smaller fields. A complete hardware and accessory package is included. Specifications: length—41 inches; wingspan—50 inches; wing area—464 square inches; weight—4 pounds; radio required—4-channel.

Part no.—4508.

Thunder Tiger USA, 2430 Lacy Ln. #120, Dallas, TX 75006.



KYOSHO

Autorotation Upgrade Kit

Improve the performance of your Concept 30 SR-T and help prevent crashes caused by engine failure. The kit includes a one-way shaft; a one-way housing with bearing; and hardware.

Part no.—KYOE2075; **price**—$46.99.

Kyosho; distributed by Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104.

INDEX OF MANUFACTURERS

Ace R/C Inc., 116 W. 19th Street, P.O. Box 472, Higginsville, MO 64037-0472; (800) 322-7121; fax (816) 584-7766.

AERO*COMP, P.O. Box 753, Hackettstown, NJ 07840-0753; (908) 850-4131.

Aero FX, Rt. 1, Box 225, Stratford, OK 74872; (405) 759-3333; fax (405) 759-3340.

Aeroloft Designs, 130 W. Hampton, Suite 20, Mesa, AZ 85210; (602) 649-8662.

Aeronaut, Stuttgarter Str. 18, 72766 Reutlingen, Germany.

AeroTech Inc, 1955 S. Palm St., Ste.15, Las Vegas, NV 89104.

Aerrow Inc., P.O. Box 183, 1881 Rogers Rd., Perth, Ontario, Canada K7H 3E3; (613) 264-0010; fax (613) 264-8441.

Airtronics, 11 Autry, Irvine, CA 92718; (714) 830-8769.

All American Kit Cutters, 365 Dutchneck Rd., Hightstown, NJ 08520; (609) 443-3175.

Altech Marketing, P.O. Box 391, Edison, NJ 08818-0391; (908) 248-8738.

APC Props; distributed by Landing Products, P.O. Box 938, Knights Landing, CA 95645; (916) 661-6515.

Astro Flight Inc., 13311 Beach Ave., Marina Del Rey, CA 90292; (310) 821-6242; fax (310) 822-6637.

Balsarite; distributed by Coverite, 420 Babylon Rd., Horsham, PA 19044; (215) 672-6720; fax (215) 672-9801.

Balsa USA, P.O. Box 164, Marinette, WI 54143; (906) 863-6421; fax (906) 863-5878.

B&B Specialties, 14234 Cleveland Rd., Granger, IN 46530.

Bisson Custom Mufflers, RR1 Taits Island, Parry Sound, Ontario, Canada P2A 2W7; phone/fax (705) 389-1156.

Bob Violett Models, 170 S.R. 419, Winter Springs, FL 32708; (407) 327-6333; fax (407) 327-5020.

Byron Originals, P.O. Box 279, Ida Grove, IA 51445; (712) 364-3165; fax (712) 364-3901.

Carden Aircraft, 1731 N.W. Madrid Way, Boca Raton, FL 33432; (407) 367-7744.

Carl Goldberg Models, 4734 W. Chicago Ave., Chicago, IL 60651; (312) 626-9550; fax (312) 626-9566.

Century Jet Models Inc., 11216 Bluegrass Pkwy, Louisville, KY 40299; (502) 266-9234; fax (502) 266-9244.

CH Electronics, P.O. Box 1732, Riverton, WY 82501; (307) 857-6897; fax (307) 857-6897.

Cheveron Hobby Products, P.O. Box 2480, Sandusky, OH 44870; (419) 797-2208; fax (419) 797-2208.

Cool Power; distributed by Omega Games, 8802 Rocky Creek Dr., Ste. 2-149, Tampa, FL 33615; (813) 661-3804; fax (813) 681-7446.

Dan Parsons Products, 11809 Fulmer Dr. NE, Albuquerque, NM 87111; (505) 296-2353.

DesignCAD; distributed by American Small Business Computers Inc., One American Way, Pryor, OK 74361-8801; (918) 825-4844; fax (918) 825-6359.

Dry Set, 903 N. Bowser Rd., Ste. 350, Dallas, TX 75081; (214) 437-6800.

Du-Bro Products, P.O. Box 815, Wauconda, IL 60084; (708) 526-2136; fax (708) 526-1604.

Dynaflite, P.O. Box 1011, San Marcos, CA 92069; (619) 744-9605; fax (619) 744-7923.

Electro Flight; distributed by Kress Jets Inc., 4308 Ulster Landing Rd., Saugerties, NY 12477; (914) 366-8149; fax (914) 336-5975.

Fiberglass Specialties, 38624 Mt. Kisco Dr., Sterling Heights, MI 48310; (810) 978-2512.

Flite Lite Composites, 466 Primero Ct., Ste. E, Cotati, CA 94931; (707) 792-9174.

FP Model Products, 622 Taylor Ave., Oradell, NJ 07649; (201) 265-4181.

Futaba Corp. of America, P.O. Box 19767, Irvine, CA 92713-9767; (714) 455-9888; fax (714) 455-9899.

Gerard Enterprises Inc., W226 N825 Eastmound Dr., Waukesha, WI 53186; (414) 521-0547; fax (414) 521-0551.

Gilbert Aircraft, 123 Goodrich St., Zeeland, MI 49464; (616) 772-1832.

Glenn Torrance Models, 1404 Falls Church Rd., Raleigh, NC 27609.

Graupner, Henriottonstr. Postfach 1242, D-73220 Kirchheim/Teck, Germany.

Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104.

Hitec/RCD Inc., 10729 Wheatlands Ave., Ste. C, Santee, CA 92071-2854; (619) 258-4940; fax (619) 449-1002.

Hobby Lobby Intl., 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444; fax (615) 377-6948.

Hobby Shack, 18480 Bandilier Cir., Fountain Valley, CA 92728-8610; (714) 964-0827; fax (714) 962-6452.

Irvine Engines; distributed by Altech Marketing/MRC, P.O. Box 391, Edison, NJ 08818-0391; (908) 248-8738.

Jet Hangar Hobbies, 10595 Bloomfield Ave., Los Alamitos, CA 90720; (310) 493-1285; fax (310) 493-1765.

Jet Model Products, 211 N. Mullen Rd., Belton, MO 64012; (816) 331-0356.

Jomar, 22483 Mission Hills Ln., Yorba Linda, CA 92687; (714) 692-1393.

JR Remote Control; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511; fax (217) 355-8734.

Kavan, Lindenaststr. 56, D-90409 Nnernberg, Germany; 0-911-364095; fax 0-911-364098.

K&B Mfg., 2100 College Dr., Lake Havasu City, AZ 86403; (602) 453-3579.

K&S Engineering, 6917 W. 59th St., Chicago, IL 60638; (312) 586-8503; fax (312) 586-8556.

Litco Systems, P.O. Box 90, East Hanover, NJ 07936; (717) 689-7835.

Lustrecoat; distributed by Carl Goldberg Models (see address above).

Madden Model Products, 255A Horicon Ave., Brant Lake, NY 12815.

Major Decals; made by Northeast Screen Graphics, P.O. Box 304, 21 Fisher Ave., Longmeadow, MA 01028.

MAP (Model Airplane Products); distributed by Slegers Intl., Rt. 15, Wharton, NJ 07885; (201) 366-2525; fax (201) 366-0549.

Master Airscrew; distributed by Windsor Propellor Co., 3219 Monier Cir., Rancho Cordova, CA 95742; (916) 631-8385; fax (916) 631-8386.

MAT Products; distributed by R&R Distributors, P.O. Box 144, Wood Ridge, NJ 07075; to order: 800-752-1650; inquiries: (201) 804-0077.

McDaniel R/C, 1654 Crofton Blvd., Ste. 4, Crofton, MD 21114; (410) 721-6303; fax (410) 721-6306.

MGA Pilots, P.O. Box 5631, Fresno, CA 93755; (209) 224-4170; fax (209) 224-2789.

O.S. Engines; distributed by Great Planes Model Distributors (see address above).

Pacer Technology, 9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.

Pirate Models Inc., 13907 Hirshfield Rd., Unit L, Tomball, TX 77375; (713) 351-6617.

Proctor Enterprises, 25450 N.E. Eilers Rd., Aurora, OR 97002; (503) 678-1300; fax (503) 678-1342.

RCD, 10729 Wheatlands Ave., Ste. C, Santee, CA 92071.

Robart Mfg., P.O. Box 1247, St. Charles, IL 60174; (708) 584-7616; fax (708) 584-3712.

Sanyo, 2001 Sanyo Ave., San Diego, CA 92173; (619) 661-6620; fax (619) 661-6743.

Sermos R/C Snap Connectors Inc., Cedar Corners Station, Box 16787, Stamford, CT 06905; (203) 322-6294.

Sig Mfg. Co. Inc., 01-7 S. Front St., Montezuma, IA 50171; (515) 623-5154; fax (515) 623-3922.

Sonic Tronics, 7865 Mill Rd., Elkins Park, PA 19117; (215) 635-6520; fax (215) 635-4951.

Soundmaster; distributed by Davis Diesel Development, P.O. Box 141, Milford, CT 06460; (203) 877-1670.

Spring Air Products, P.O. Box 37-3218, Satellite Beach, FL 32937; (407) 728-9002; fax (407) 728-2881.

SR Batteries, P.O. Box 287, Bellport, NY 11713; (516) 286-0079; fax (516) 286-0901.

Sterling Models, 3100 "C" Street, Philadelphia, PA 19134.

Sullivan Products, P.O. Box 5166, Baltimore, MD 21224; (410) 732-3500; fax (410) 327-7443.

TAGS, c/o Graham Packaging & Design, 2787 Stage Center Dr., Memphis, TN 38134.

The Aeroplane Works, 2134 Gillbridge Rd., Martinsville, NJ 08836.

Top Flite Models; distributed by Great Planes Model Distributors (see address above).

Tru-Turn, P.O. Box 836, South Houston, TX 77587; (713) 943-1867.

Usher Enterprises, 9810 N.W. Gordon Rd., Cornelius, OR 97113.

Vinylwrite Custom Lettering, 16043 Tulsa St., Granada Hills, CA 91344.

Webra; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511; fax (217) 355-8734.

Wendall Hostetler Plans, 1041 Heatherwood Ln., Orrville, OH 44667; (216) 682-8890.

Yellow Aircraft, 203 Massachusetts Ave., Lexington, MA 02173; (617) 674-2222; fax (617) 674-2188.

Zap; distributed by Pacer Technology (see address above).

Zenoah; distributed by Indy R/C, 10620 N. College Ave., Indianapolis, IN 46280; (317) 846-0766; fax (317) 848-1015.

Zinger; distributed by J&Z Products, 25029 Vermont Ave., Harbor City, CA 90710.

Z-Poxy; distributed by Pacer Technology (see address above).

NAME THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If you can, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.

Congratulations to Charles P. Stover of Ridgefield, CT, for correctly identifying the July '95 mystery plane. The Ilyushin Il-2M-3 "Stormovik" was known as "the flying tank." It had 4- to 8mm-thick armor plating that protected its crew and vital components. To shoot it down, Axis fighters discovered that they had to sneak up behind it from underneath and shoot out its oil cooler. In the early '40s, the Stormovik was manufactured by a state factory in Russia as a low-wing cantilever monoplane. It had a Mikulin AM-38F, 12-cylinder, vee, liquid-cooled 1,770hp engine that gave it a top speed of around 260mph. It had a range of 475 miles and a ceiling of 21,600 feet. The Il-2M-3 had a variety of armament that included two 23mm cannons, three machine guns, 1,325 pounds of bombs and eight 82mm rockets. The 47-foot, 11-inch-span plane was 38 feet, 3 inches long, 11 feet 2 inches high and weighed 14,021 pounds. It was used as a low-level attack aircraft on the Eastern Front and was Russia's most successful ground-attack plane. ■

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to **Model Airplane News**. If already a subscriber, the winner will receive a free one-year extension of his subscription.

CLUB OF THE MONTH

THE SPRINGFIELD R/C FLYING CLUB
"HOME OF THE BLACK SHEEP"
858 N. Elm St., Marshfield, MO 65706

This summer, the Springfield R/C Flying Club was busy building and flying models and "helping those who can't help themselves"—homeless and abused dogs and cats. The Southwest Missouri Humane Society was the beneficiary of the club's charity fun-fly, which generated two or three pickup trucks full of pet food. Profits from the T-shirt sales, admission fees and concession stands were also donated to the society.

In the June '95 issue of "Airmail," the Springfield Flying Club newsletter, a "Tips & Tech" column by Jack Bryant covers propeller safety and how to make a handy stand for CA and other "spillable" adhesives. A checklist for inspecting trainer aircraft outlines good preflight procedure, and a calendar-of-events list informs members of club events and R/C contests and fun-flys in the area.

For the past few months, club president Dallas Porter and club member Jackson Jean have spent Tuesday and Thursday nights constructing a new club trainer. They invited some master modelers to give classes and share their building expertise while working on the model so that new fliers could actively learn construction techniques. Now the club has a brand-new model that "looks like a million bucks," and some novice modelers have the skills they need to build a plane on their own.

We applaud the Springfield R/C Flying Club for giving back to their community and for sharing with one another. Two subscriptions to *Model Airplane News* are on the way. ■

Advertiser Index

FINAL APPROACH

HOW FAST?

How fast is the fastest R/C airplane? In the late '70s, Werner Sitar set an official record of just over 242mph with a slope-soaring sailplane. Reportedly, another slope-soaring speed record—248mph—has been set since then. The next-fastest category is that of ducted fans. In mid-'94, Chris Huhn (flying a BVM Aggressor III) and Bob Violett (flying a BVM Ultra Viper) both reached a top speed of 236mph; a few giant-scale unlimited racers have also topped 200mph. But how fast can the sport modeler expect to fly using readily available gear?

Russ Pribanic holds his customized Gilbert Aircraft Diamond Dust. The 575-square-inch plane has a 34.5-inch wingspan and, with an O.S. .46 ducted-fan engine, it weighs only 2 pounds, 11 ounces.

Contributor and master modeler Russ Pribanic recently took a stab at finding out. To minimize drag as well as building time, he chose a triangular flying wing—the Gilbert Aircraft* Diamond Dust. Because the kit's laser-cut parts virtually snap together, it took Russ only 8 to 10 hours to complete. The kit's lightweight construction includes composite-tube leading edges and spars, only four ribs (excluding wingtips) and generous open bays between the ribs.

The custom-built, drag-reducing cowl hugs the aft portion of the engine and encloses the tuned pipe.

The Diamond Dust is rated for a .20 to .40 2-stroke. Russ upped the ante and installed an O.S.* .46 rear-exhaust, ducted-fan engine with a Soundmaster* tuned pipe. He first propped it with an APC* 10x10, but the engine wasn't getting on the pipe and rpm were lagging. Changing to an APC 9x9 put rpm in the high teens, and unloading in the air could be expected to bring max rpm to the mid-20,000s. This suggests a top speed in the 200mph range.

FLIGHT PERFORMANCE

Russ's Diamond Dust weighs 2 pounds, 11 ounces, and that includes the .46, the 2-ounce cowl and two 100-in.-oz. servos that control the elevons. The prop, developing more than twice the plane's weight in thrust, easily pulls it into the air. During the first flight at the Kingston, Ontario, fun fly in June, the modified Diamond Dust picked up speed so quickly that a special flight pattern—a large U-shape track pushing straight up into the sky—had to be established so that it wouldn't fly out of sight. How fast is it? A nearly identical plane flown at that meet, but without the special cowl, was radar-clocked on a preliminary horizontal high-speed pass at 207mph. Russ's plane flew faster, but only for a short period.

After one high-speed flyby, the plane became a small dot in the sky and apparently lost contact with the transmitter; it tumbled to the ground. Because the sound of the impact took more than 2 seconds to reach Russ, he estimated that the plane went down about ½ mile out. Before it augured in, it had been flying at well over 200mph—an accomplishment that ranks it among the fastest slope racers, ducted fans and unlimited racers. Russ plans to build another, and we'll report its maximum speed. Can you build a faster plane? Our readers are interested, so let us know.

—*Tom Atwood*

LOW-DRAG COWL

Russ built a cowl to enclose the tuned pipe and reduce drag around the engine. He covered the engine and pipe with plastic wrap and then sculpted modeling clay over the power system to the shape of the desired cowl. He covered the clay with plastic wrap and laid down five layers of 3-ounce cloth impregnated with epoxy resin. After removing this female mold, he sanded, primed and painted the interior surface with K&B* epoxy-based paint. To make a cowl, he applied Part All mold release and two layers of epoxy-impregnated, 3-ounce cloth to the interior of the female mold. He cut exits in the molded cowl for the tuned pipe and the elevon control rods. Four screws hold the finished cowl down.

**Addresses are listed alphabetically in the Index of Manufacturers on page 135.*